R+ ST series

MANUAL DEL USUARIO / USER'S GUIDE

D.A.S. SOUND PRODUCTS

El signo de exclamación dentro de un triángulo indica la existencia de importantes instrucciones de operación y mantenimiento en la documentación que acompaña al producto.

The exclamation point inside an equilateral triangle is intended to alert the users to the presence of important operating and maintenance (servicing) instructions in the literature accompanying the product.

Das Ausrufezeichen im Dreieck weist auf inhaltlich besonders wichtige Erklärungen des nebenstehenden Textes hin.

Le point d'exclamation dans un triangle équilatéral alerte signale la présence d'informations importantes de fonctionnement et de maintenance dans le manuel qui accompagne le produit.

El doble cuadrado indica equipo de Clase 2.

The double square indicates Class 2 device.

Das doppelte Viereck bedeutet daß es sich um ein Gerät der Klasse 2 handelt.

Le double carré circonscrit indique un appareil de Classe 2.

No exponga este equipo a lluvia o humedad.

Do not expose this device to rain or moisture.

Dieses Gerät nicht dem Regen oder extremer Feuchtigkeit aussetzen.

Ne pas exposer l'appareil à la pluie ou à l'humidité.

No emplace altavoces en proximidad a equipos sensibles a campos magnéticos, tales como monitores de televisión o material magnético de almacenamiento de datos.

Do not place loudspeakers in proximity to devices sensitive to magnetic fields such as television monitors or data storage magnetic material.

Plazieren Sie Lautsprecher nicht in der Nähe von Geräten die empfindlich auf magnetische Felder sind (z.B.: Fernsehmonitore, magnetische Datenmedien).

Ne pas disposer ces enceintes à proximité d'appareils ou supports sensibles aux champs magnétiques tels que moniteurs vidéo, télévision ou diskettes et cassettes vidéo/audio.

No existen partes ajustables por el usuario en el interior de este equipo.

No user serviceable parts inside.

Es sind keine vom Anwender einstellbaren Teile im Gerät enthalten.

Aucune pièce est réparable par l'utilisateur à l´interieur.

Altura máxima de seguridad desde el suelo a la base de la caja montada sobre trípode modelo TRD-2, pies a su máxima extensión:

R-112	112 cm
R-115	99 cm
ST-015	115 cm
ST-15	112 cm
ST-32	107 cm

Maximum safety height from floor to bottom of enclosure when mounting on a TRD-2 tripod with legs fully open:

R-112	112 cm
R-115	99 cm
ST-015	115 cm
ST-15	112 cm
ST-32	107 cm

Maximale Höhe des Unterteils der Box bis zum Boden, wenn auf dem Ständer TRD-2, mit voll aufgeklappten Gestell montiert:

R-112	112 cm
R-115	99 cm
ST-015	115 cm
ST-15	112 cm
ST-32	107 cm

Distance maximum du sol à la base des enceintes montées sur le tripode TRD-2 à ouverture maxi des pieds:

R-112	112 cm
R-115	99 cm
ST-015	115 cm
ST-15	112 cm
ST-32	107 cm

El resto de los modelos no se pueden montar en trípode.

The rest of the models are not tripod mountable.

Restliche Typen können nicht auf Lautsprecherstative montiert werden.

Les autres modeles ne sont pas montables sur tripode.

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1. INTRODUCTION

Thank you for purchasing a D.A.S. product. The ST and R series represent more than 30 years of expertise in transducer and enclosure design, achieving a series of systems that utilise the most advanced sound reinforcement technology to deliver outstanding audio performance and maximum reliability.

Engineered from "real world" experience in system design, with exceptional efficiency, pattern control and intelligibility, these series provide designers with the primary tools to solve the problems of sound reinforcement.

For those systems that require enclosures featuring different configurations or smaller size, ST and R series may be combined with other series from D.A.S. For instance, a main theatre system based around R or ST could use a compact 8" model from our Dynamics Series for distributed fills.

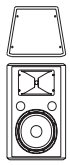
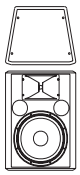
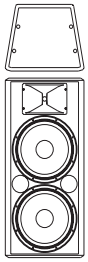
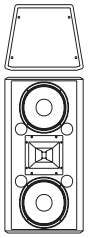
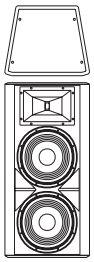
This manual contains the required information to make the best use of the system you have purchased. Please take the time to read it.

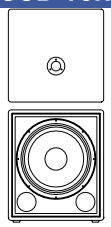
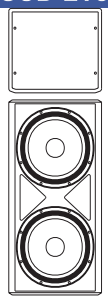
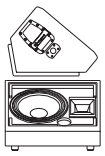
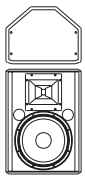
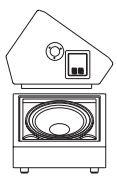
Our Web site at www.dasaudio.com contains further support information such as enclosure and system drawings, data for modelling software, architectural specifications and specification sheets.

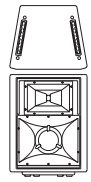
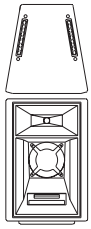
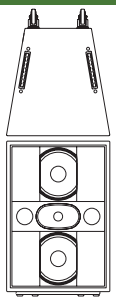
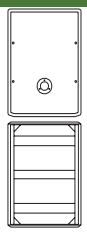
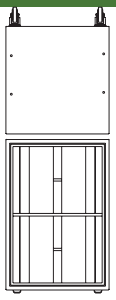
1.1 Series' features

- High frequency compression drivers with pure titanium diaphragms and Neodymium magnet structures (except models with small format HF drivers, which use ferrite magnets)
- Rugged enclosures manufactured from Finnish Wisa® plywood for rigidity and durability (except SUB-18R, MDF wood)
- Bar handles or hand locations for easy transport
- Finished in catalysed polyurethane black paint that provides protection against the elements and abrasion. The finish may be painted on to complement the decor
- Polyamide powder coated front grilles prevent corrosion and maintain good looks. On the ST series, the grilles are covered with acoustically transparent cloth for protection against rain, dust and dirt
- Dual NL4 or NL8 (model dependent) Speakon input/output connectors
- Tripod mountable (models for which size allows)
- Flying points (eyebolt based or AncraTrack/eyebolt according to model). Except ST-32, ST-015 and SUB-18R.
- Optional flying accessories

1.2 Models' features

PRODUCT	FEATURES	APPLICATIONS
R-112 	• Two-way full-range system • Trapezoidal enclosure • Tripod socket • Passive (full-range) use • 1 x 12" woofer • Small format compression driver with ASC protection • Medium power • Medium sensitivity • Short / medium throw	• Sound reinforcement for fixed installations. Pubs, restaurants, discos, indoor sport arenas. Stand-alone or subwoofer reinforced • Secondary area fills
R-115 	• Two-way full-range system • Trapezoidal enclosure • Tripod socket • Passive (full-range) use • 1 x 15" woofer • Small format compression driver with ASC protection • Medium power • Medium sensitivity • Short / medium throw	• Sound reinforcement for fixed installations. Pubs, restaurants, discos, indoor sport arenas • Secondary area fills.
R-214 	• Two-way full-range system • Trapezoidal enclosure • Passive (full-range) use • 2 x 15" woofer • Small format compression driver with ASC protection • Medium / high power • Medium sensitivity • Short / medium throw	• Sound reinforcement for fixed installations. Pubs, live music bars • Medium power side-fill
R-212 	• Two-way mid-high / full-range system • Trapezoidal enclosure • Bi-amplified and passive (full-range) modes • 2 x 12" mid-high speakers • Neodymium magnet large format compression driver • High power • Medium / high sensitivity • Medium throw • Rotatable horn	• Sound reinforcement for fixed installations. Live sound, theatres, discos. **Always** use sub-woofer complement
R-215 	• Two-way full-range system • Trapezoidal enclosure • Bi-amplified and passive (full-range) modes • 2 x 15" woofers • Neodymium magnet large format compression driver • High power • Medium / high sensitivity • Medium / long throw • Transport wheels	• Sound reinforcement for fixed installations and mobile use. Live sound, theatres, discos. Stand-alone or sub-woofer reinforced • Side-fill

PRODUCT	FEATURES	APPLICATIONS
SUB-18R 	• Sub-woofer system • Rectangular enclosure • Tripod socket for mid-high enclosures • 1 x 18" woofer • Medium power • Medium sensitivity	• Low frequency reinforcement for fixed installations. Pubs, bands, theatres
SUB-218 	• Sub-woofer system • Rectangular enclosure • 2 x 18" woofers • High power • Medium sensitivity	• Low frequency reinforcement for fixed installations and mobile applications. Live sound, theatres, discos
ST-015 	• Two-way mid-high / full-range system • Tripod socket • Passive (full-range) use • 1 x 15" mid-high speaker • Neodymium magnet medium format compression driver • Medium power • Medium sensitivity • Short / medium throw • Left and right (shown) versions	• Low-profile stage monitor wedge
ST-15 	• Two-way mid-high / full-range system • Low profile multi-angle enclosure • Tripod socket • Bi-amplified and passive (full-range) modes • 1 x 15" mid-high speaker • Neodymium magnet large format compression driver • Medium / high power • Medium sensitivity • Medium throw • Rotatable horn	• Sound reinforcement for fixed installations and mobile applications. Theatres, discos. **Always** use sub-woofer complement • High power low profile system for low ceiling applications • High power stage monitor wedge
ST-32 	• Two-way full-range system • Tripod socket • Passive (full-range) use • 1 x 15" coaxial speaker • Small format compression driver with ASC protection • Medium power • Medium sensitivity • Short / medium throw • Uniform directivity helps fight feedback	• Stage monitor wedge • Multi-purpose system

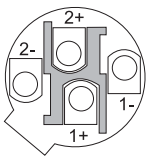
PRODUCT	FEATURES	APPLICATIONS
ST-110 	• Two-way mid-high system • Trapezoidal enclosure • Passive use • 1 x 10" mid-range speaker • Neodymium magnet large format compression driver • Medium / high power • High sensitivity • Medium / long throw	• Sound reinforcement for fixed installations and mobile applications. Touring, large scale discos. Always use sub-woofer complement • Vocal system for speech applications and background music in large spaces
ST-112 	• Two-way mid-high system • Trapezoidal enclosure • Bi-amplified use • 1 x 12" mid-range speaker • Neodymium magnet large format compression driver • Medium / high power • High sensitivity • Medium / long throw	• Sound reinforcement for fixed installations and mobile applications. Touring, large scale discos. Use sub-woofer complement • Vocal system for speech applications and background music in large spaces
ST-215 	• Two-way mid-high system • Trapezoidal enclosure • Bi-amplified use • 2 x 15" mid-range speakers • Neodymium magnet large format compression driver • High power • High sensitivity • Long throw • Transport wheels	• Sound reinforcement for fixed installations and mobile applications. Touring. Use sub-woofer complement • Sound reinforcement in large spaces
ST-18 	• Folded-horn sub-woofer system • Rectangular enclosure • Tripod socket for mid-high enclosures • 1 x 18" woofer • High power • High sensitivity	• Low frequency reinforcement for fixed installations and medium-sized mobile applications. Pubs, bands
ST-218 	• Folded-horn sub-woofer system • Rectangular enclosure • 2 x 18" woofers • High power • High sensitivity • Transport wheels	• Low frequency reinforcement for fixed installations and mobile applications. Live sound, touring, discos

2. CONNECTIONS

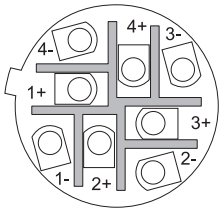
2.1 Wiring

R and ST series enclosures utilise two NL4 (four pin) or NL8 (eight pin) Neutrik Speakon connectors. These connectors are specific for speaker use and allow a safe and professional connection. Models ST-112, ST-215, ST-18 and ST-218 use NL8, the rest use NL4. For plugging into an enclosure, insert the male connector into any of the inputs and rotate it clockwise. It will then lock into place and be ready for use.

The drawing illustrates the terminal arrangement detail:



NEUTRIK SPEAKON NL4



NEUTRIK SPEAKON NL8

The enclosures provide two paralleled connectors. This allows for easy loop through from one speaker to the next. Unused connector pins are also paralleled. Both connectors can be used as either inputs or outputs.

To ensure quality sound and minimum power loss, the speaker cable needs to have a large enough cross section depending on the cable length, number of speakers per channel and speaker impedance. The total impedance for a number of speakers in parallel is equal to the impedance of one divided by the number of speakers. For instance, two R-112 in parallel total 4 ohms (8 ohms divided by 2 boxes equal 4). It is particularly important to use a large enough gauge with those speakers that carry deep bass, such as ST-18/218, SUB-18R/218 o R-215.

8 ohm per amplifier channel			
Cable length		**Minimum cable thickness**	
metres	feet	mm²	Gauge no. (AWG)
2,5	8	0,3	22
5	16	0,5	22
7,5	25	0,8	18
10	33	1,31	16
15	50	2,1	14
20	66	3,3	12
50	164	5,3	10
75	250	8,35	8
100	328	13,3	6
200	656	20,8	4
400	1312	33,3	2
4 ohm per amplifier channel			
Cable length		**Minimum cable thickness**	
metres	feet	mm²	Gauge no. (AWG)
2,5	8	0,8	18
5	16	1,31	16
7,5	25	2,1	14
10	33	3,3	12
15	50	5,3	10
20	66	5,3	10
50	164	13,3	6
75	250	20,8	4
100	328	33,3	2
200	656	52,9	0
400	1312	80,2	000

The tables show the minimum size for different runs of cable and four or eight ohms connected per channel:

- Use the eight ohm table when connecting a single eight ohm speaker per channel. For instance, one R-115 in each channel of a stereo amplifier or the mid frequency band of an ST-112,

- Use the four ohm table when connecting two eight ohm speakers to an amplifier channel. For instance, two R-115 units in parallel. Also for one four ohm speaker per channel, such as for one ST-218 per channel.

When connecting more than one speaker to an amplifier channel there are two wiring options. The first is to run cable from the amplifier's output terminals to each speaker. The second is to connect the closest speaker to the amplifier and then connect the two speakers together with a loop through cable that has a Speakon (NL8 or NL4 according to the model) connector on both ends. We'll be paralleling speakers in both cases. The latter is the most common and practical option, the former providing a higher damping factor.

Never use a total impedance load that is lower than the lowest impedance that an amplifier will take. Virtually all professional amplifiers will accept loads down to four ohms safely in stereo mode. Many are rated for two ohm loads but often will run into overheating protection when used this way, particularly in high ambient temperature and high output power applications. Never connect more speakers to an amplifier's channel than it will take, i.e. do not load a channel with a total impedance that is lower than the minimum load specified by the manufacturer.

Avoid series or series-parallel wiring schemes for ST and R series products, since they degrade sound quality and thus we do not recommend them for applications other than background music, paging, or surround sound.

2.2 Basic connection

This section provides information on the pin assignments and basic set-up for the different enclosures. The "System Configurations" section adds stereo system configurations with or without sub-woofer reinforcement. The "Application Examples" section adds complete application specific system examples.

Some models, due to the complexities of their electronic processing, require the indicated D.A.S. controller for the system to run correctly. Others may use generic crossover units with recommended settings, although the use of the D.A.S. processors is recommended. In general, we stress the importance of the use of the DAS processors, since they are shipped with set energy balances and crossover frequencies, and adjustments cannot be made that could endanger system components. By using the DAS processors, we can ensure the correctness of the sound and the reliability of the systems.

The following table shows the basic features of the DAS CT controllers:

Model	CT-1	CT-1000	CT-1500	CT-1800	CT-2000
Type	Stereo	Mono			
Modes	Full range/2-way	2-way / 3-way	2-way	3-way	2-way / 3-way
Limiters	---	Variable per way			
Gain Controls	Low	Low-Mid-High	Low-High	Low-Mid-High	
Xover freqs	100 Hz	1200 / 125, 1200 Hz	160 Hz	125, 1200 Hz	1200 / 125, 1200 Hz

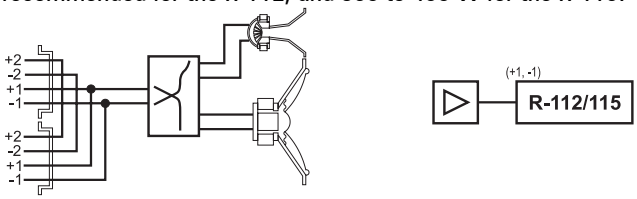
The following table shows the controller for each system with or without subwoofer reinforcement.

Model	Stand-alone	With subwoofer reinforcement (SUB-18R/218, ST-18/218)
R-112 / R-115 / R-214	None	CT-1
R-212 / R-215 in passive mode	None	CT-1
R-212 / R-215 in active mode	CT-2000, CT-1000	CT-2000, CT-1000
ST-15 in passive mode	None	CT-1
ST-15 in active mode	CT-1000	CT-1000
ST-015 / ST-32	None	Not available
ST-110	Not available	CT-1500
ST-112	Not available	CT-1800
ST-215	CT-2000	CT-2000

If you wish to use a programmable digital processor, contact your DAS distributor to get a list of set-up parameters for your system.

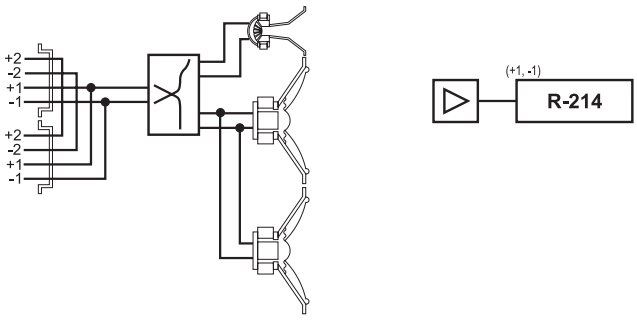
R-112/115

Figures show the block diagram and basic set-up for models R-112 and R-115. 300 to 400 watts of amplifier power are recommended for the R-112, and 350 to 450 W for the R-115.



R-214

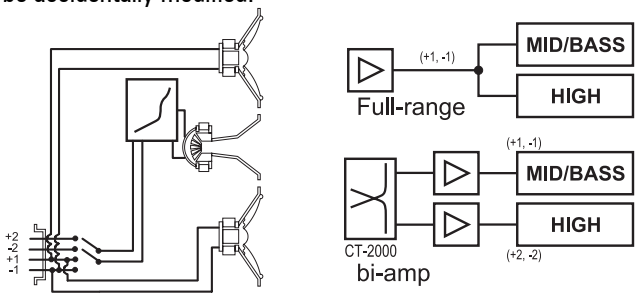
Figures show the block diagram and basic set-up for model R-214.



R-212

Figures show the block diagram and basic set-up. A switch, located at the input connector plate, allows to change between passive (full-range) and bi-amplified use. In passive use, the acoustical high frequency rolloff of the low frequency section is used to crossover to the mid/high frequency section, which utilises an equalised highpass filter network.

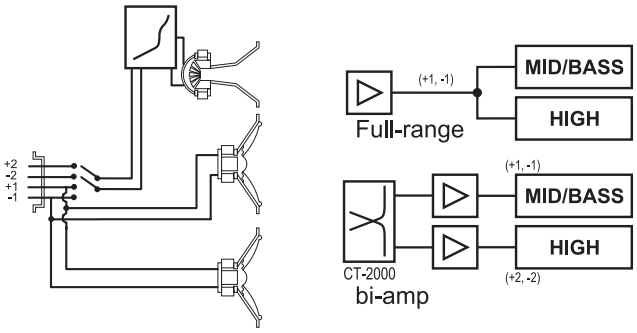
When using the system in active (bi-amplified) mode, use the D.A.S. CT-2000 monophonic electronic processor or a 24/dB octave electronic crossover unit with the crossover frequency set to 1200 Hz. We thoroughly recommend the use of the D.A.S. CT-2000 (CT-1000 can also be used for applications outside disco/club), since it is factory shipped with appropriate crossover frequencies, which cannot be accidentally modified.



R-215

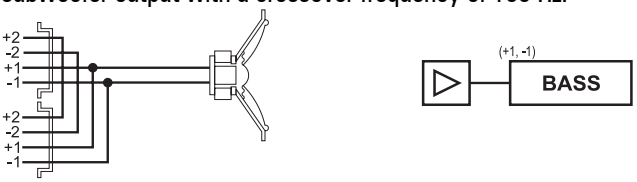
Figures show the block diagram and basic set-up. A switch located at the input connector plate, allows to change between passive (full-range) and bi-amplified use. In passive use, the acoustical high frequency rolloff of the low frequency section is used to crossover to the mid/high frequency section, which utilises an equalised highpass filter network.

When using the system in active (bi-amplified) mode, use the D.A.S. CT-2000 monophonic electronic processor or a 24/dB octave electronic crossover unit with the crossover frequency set to 1200 Hz. We thoroughly recommend the use of the D.A.S. CT-2000 (CT-1000 can also be used for applications outside disco/club), since it is factory shipped with appropriate crossover frequencies, which cannot be accidentally modified.



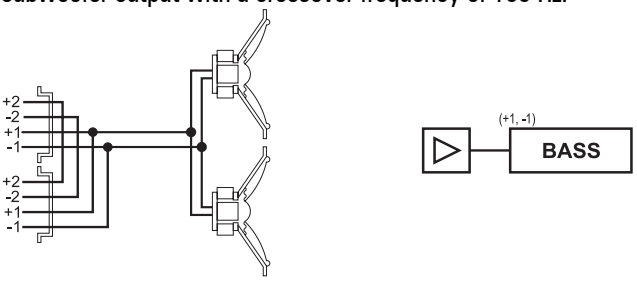
SUB-18R

Figures show the block diagram and basic set-up. The SUB-18R is a bass unit for active systems, so an electronic crossover will be required with a crossover frequency set in the range from 80 to 160 Hz. One of such units, capable of driving two way-active systems, is the D.A.S. CT-1, which features a mid/high stereo output and a monophonic subwoofer output with a crossover frequency of 100 Hz.



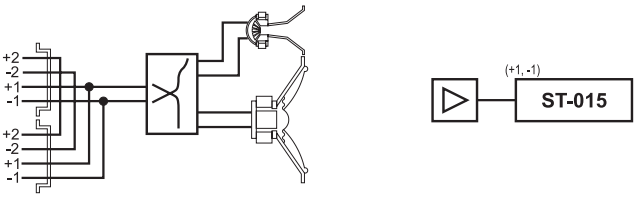
SUB-218

Figures show the block diagram and basic set-up. The SUB-218 is a bass unit for active systems, so an electronic crossover will be required with a crossover frequency set in the range from 80 to 160 Hz. One of such units, capable of driving two way-active systems, is the D.A.S. CT-1, which features a mid/high stereo output and a monophonic subwoofer output with a crossover frequency of 100 Hz.



ST-015

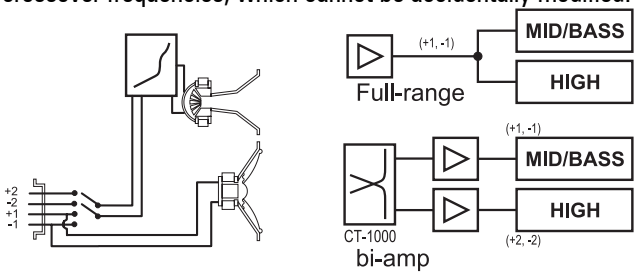
Figures show the block diagram and basic set-up for model ST-015.



ST-15

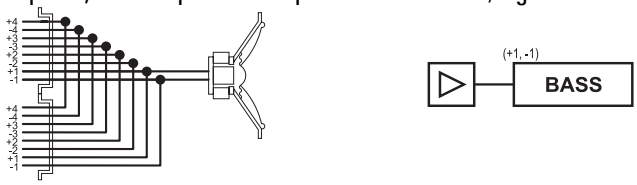
Figures show the block diagram and basic set-up. A switch located at the input connector plate, allows to change between passive (full-range) and bi-amplified use. In passive use, the acoustical high frequency rolloff of the low frequency section is used to crossover to the mid/high frequency section, which utilises an equalised highpass filter network.

When using the system in active (bi-amplified) mode, use the D.A.S. CT-1000 monophonic electronic processor or a 24/dB octave electronic crossover unit with the crossover frequency set to 1200 Hz. We thoroughly recommend the use of the D.A.S. CT-1000, since it is factory shipped with appropriate crossover frequencies, which cannot be accidentally modified.



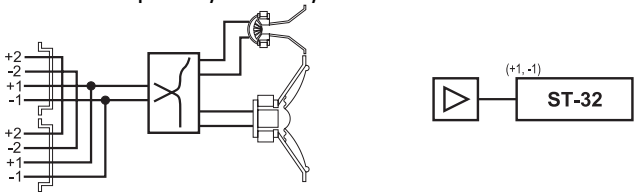
ST-18

Figures show the block diagram and basic set-up. The ST-18 is a bass unit for active systems, so an electronic crossover will be required with a crossover frequency set in the range from 80 to 160 Hz. One of such units, capable of driving two way-active systems, is the D.A.S. CT-1, which features a mid/high stereo output and a monophonic subwoofer output with a crossover frequency of 100 Hz. If used in conjunction with a mid/high D.A.S. unit for which a specific processor is required, use the processor specified for the mid/high unit.



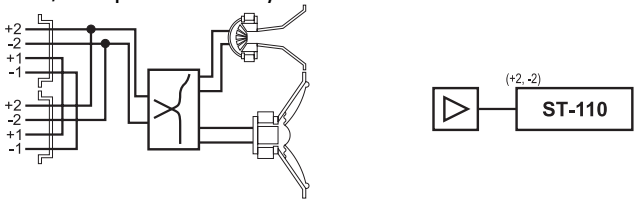
ST-32

Figures show the block diagram and basic set-up for model ST-32. Hi and low frequency units are mounted coaxially, but are shown separately for clarity.



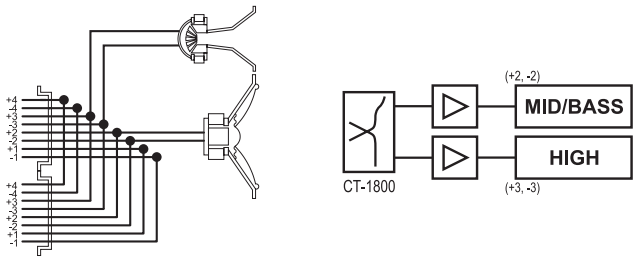
ST-110

Figures show the block diagram and basic set-up. The use of the D.A.S. CT-1500, a two-way active monophonic system processor for driving the ST-110 in conjunction with bass units, is required for this system.



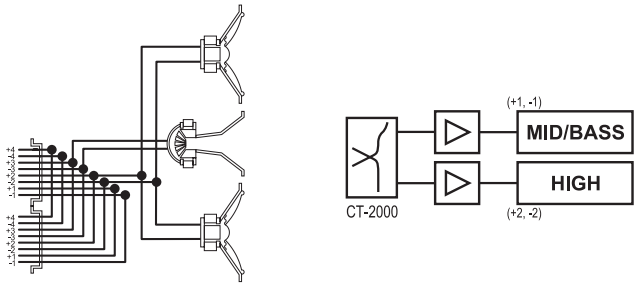
ST-112

Figures show the block diagram and basic set-up. Due to the complexities of its electronic processing, it requires the use of the D.A.S. CT-1800, a three way active monophonic system processor for driving the ST-112 in conjunction with bass units.



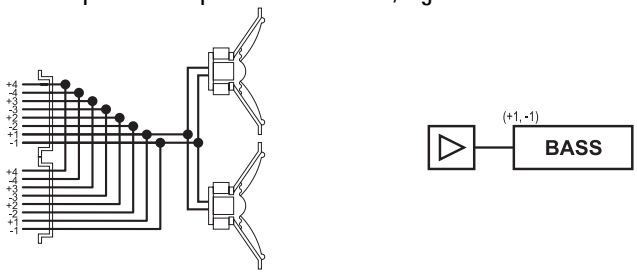
ST-215

Figures show the block diagram and basic set-up. Due to the complexities of its electronic processing, it requires the use of the D.A.S. CT-2000, a two/three way active monophonic system processor for driving the ST-215 in conjunction with bass units or standalone.



ST-218

Figures show the block diagram and basic set-up. The ST-218 is a bass unit for active systems, so an electronic crossover will be required with a crossover frequency set in the range from 80 to 160 Hz. One of such units, capable of driving two way-active systems, is the D.A.S. CT-1, which features a mid/high stereo output and a monophonic subwoofer output with a crossover of 100 Hz. If used in conjunction with a mid/high D.A.S. unit for which a specific processor is required, use the processor specified for the mid/high unit.



3. PLACEMENT AND MOUNTING

3.1 Placement

Place the speakers ahead of the microphones. Feedback (howling) occurs when the microphones pick up the sound that comes out of the speakers and feed it back to the system. Feedback can cause damage to the speaker system. If space is limited, direct the speakers towards areas where there are no microphones to minimise feedback.

When using a turntable, place the speakers far from the turntables. If the speaker signal is picked up by the stylus and re-amplified, low frequency howling will occur. The use of a very heavy base for the turntable is recommended.

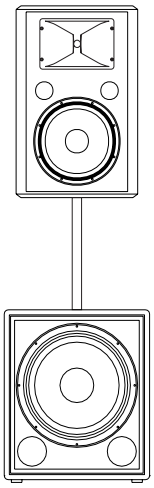
Bass output for bass cabinets in general will increase when placed against floors and/or walls. In this case, you may need to attenuate the gain of the low frequency section or use attenuation on the low frequency equalisation.

3.2 Tripod use

The more portable models feature a tripod socket for use with standard 35-mm tripods such as the D.A.S. TRD-2. Be careful not to raise the units too high on the tripod, as they may become unstable. Do not use a tripod on sloped surfaces.

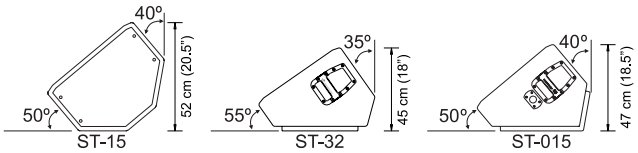
3.3 Use on SUB-18R / ST-18 with TRD-4

The top panel of models SUB-18R and ST-18 features a tripod socket for use with standard 35-mm poles. This allows pole mounting for systems that have tripod capability. The TRD-4 is a 35-mm pole that raises the top box 51 cm (21").
Do not mount systems this way on sloped surfaces.



3.4 Stage monitor use

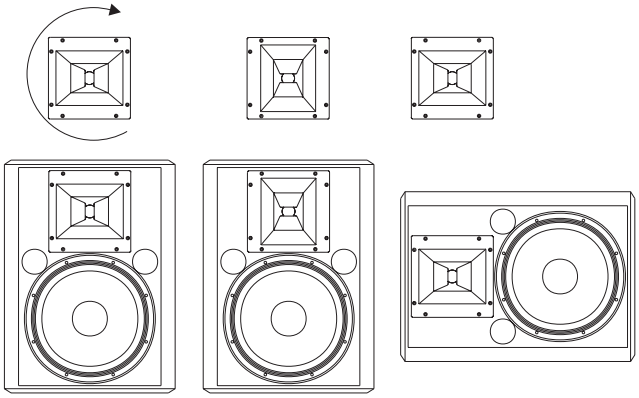
Operation angles for boxes capable of monitor use are illustrated below.



3.5 Rotating the horns

Models ST-15 and R-212 have rotatable horns. This allows maintaining the original horn characteristics (wider horizontal coverage than vertical) when mounted in horizontal position. This feature is particularly useful in low ceiling rooms.

To rotate the horns you will need to remove the front grille first, then the horn. Then carefully rotate the horn 90 degrees, being careful not to disconnect the wires. Then screw the horn back into place and replace the grille.



3.6 Weather resistance

R and ST series cabinets are manufactured from phenolic plywood finished with a special polyurethane paint that protects the wood from water and humidity. Additionally, ST series units have an acoustically transparent cloth that will further protect the components from the rain.

Speaker cones are protected against humidity at the factory with a fine coat of varnish. If the speakers will be exposed to the elements, you may additionally treat the paper cones with a water repelling spray or by applying a coat of varnish. Always bear in mind that any coating should be very light so as not to change the weight of the cone significantly.

In fixed installations, do not expose the components to direct rain. For open-air applications, place the speakers under some form of canopy or cover.

4. FLYING

Warnings

Only experienced installers should fly speaker boxes. Consult a certified professional if needed. Local regulations may apply with regards to overhead suspension.

The working load limits in this manual are the results of tests by independent laboratories. It is the user's responsibility to stay within safe limits.

Working load data for auxiliary hardware mentioned in this manual have been obtained from their manufacturers, who are responsible for the compliance to their specifications.

To this date, there is no international standard regarding the flying of acoustic systems. However, it is common practice to apply 5:1 safety factors for enclosures and static elements, and 7:1 for slings and elements exposed to material fatigue due to friction and load variation. Thus, an element with a breaking load limit of 1000 kg may be statically loaded with 200 kg and dynamically loaded with 142 Kg.

When flying a system, the working load must be lower than the resistance of each individual flying point in the enclosure.

Hanging hardware should be regularly inspected and suspect units replaced if in doubt. This is important to avoid injury and absolutely no risks should be taken on this respect. It is highly recommended that you implement an inspection and maintenance programme on flying elements, including reports to be filled out by the personnel that will carry out the inspections. Local regulations may exist that, in case of accident, may require you to present evidence of inspection reports and corrective actions after defects were found.

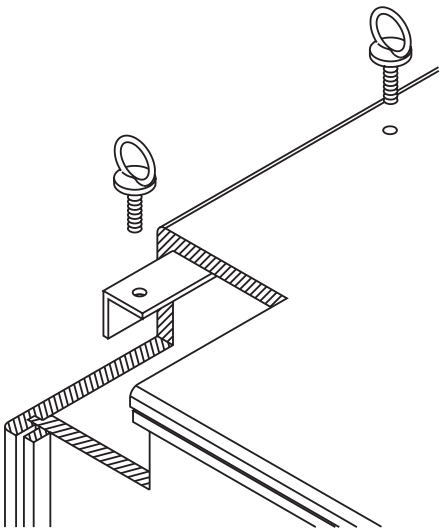
Absolutely no risks should be taken with regards to public safety.

When flying enclosures from ceiling support structures, extreme care should be taken to assure the load bearing capabilities of the structures so that the installation is absolutely safe. Do not fly enclosures from unsafe structures. Consult a certified professional if needed.

4.1 Introduction

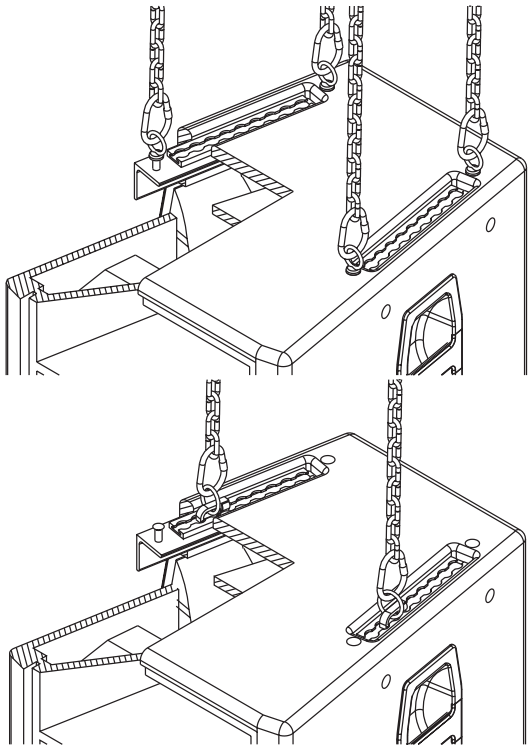
Flyable ST and R series models feature 4 internal steel angles, with 4 mounting threads each, so that 16 flying points are available (4 on each side, 4 on the top panel and 4 on the bottom panel). Eyebolt flying points are factory sealed with M10 screws, which are replaced with eyebolts on the flying points as required. Flying with eyebolts is very economical and safe, and is specially recommended for fixed installations where the boxes are permanently fixed.

The illustration shows the internal metal hardware of an enclosure with eyebolt flying.



In addition to the eyebolt flying points, some models provide two aeronautic-type AncraTracks on the top panel and two on the bottom panel. This system allows fast system flying using two or four rigging points.

The illustration shows the internal metal hardware and hanging of an enclosure with eyebolt and track-based flying.

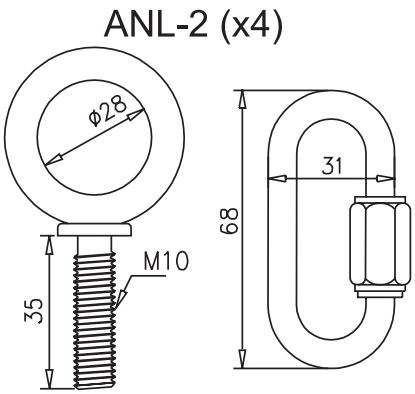


Truss modules and accessories are available for flying DAS boxes. Consult your distributor for information.

4.2 Flying with eyebolts

The Allen-head screws must be removed and replaced by M10 eyebolts on one side of the enclosure. Each rigging point has 200 Kg (440 lb) working load limit. Then choose the slings or chains of required load resistance and length, bearing in mind that the length difference between the front and back slings or chains will determine the vertical orientation. Alternatively, the back bottom eyebolt points can be used to provide vertical orientation.

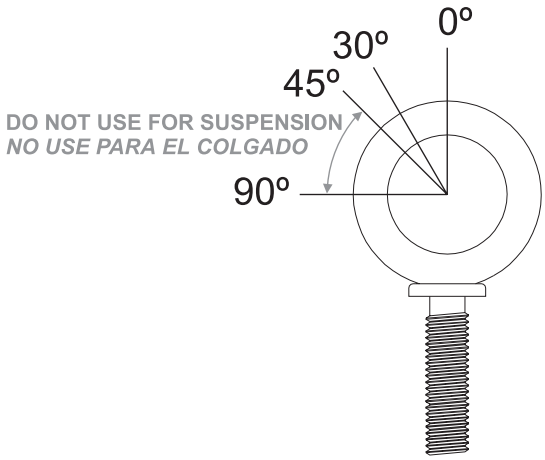
The ANL-2 set is an optional set of four eyebolts and four carabiners. (Dimensions are in millimetres)



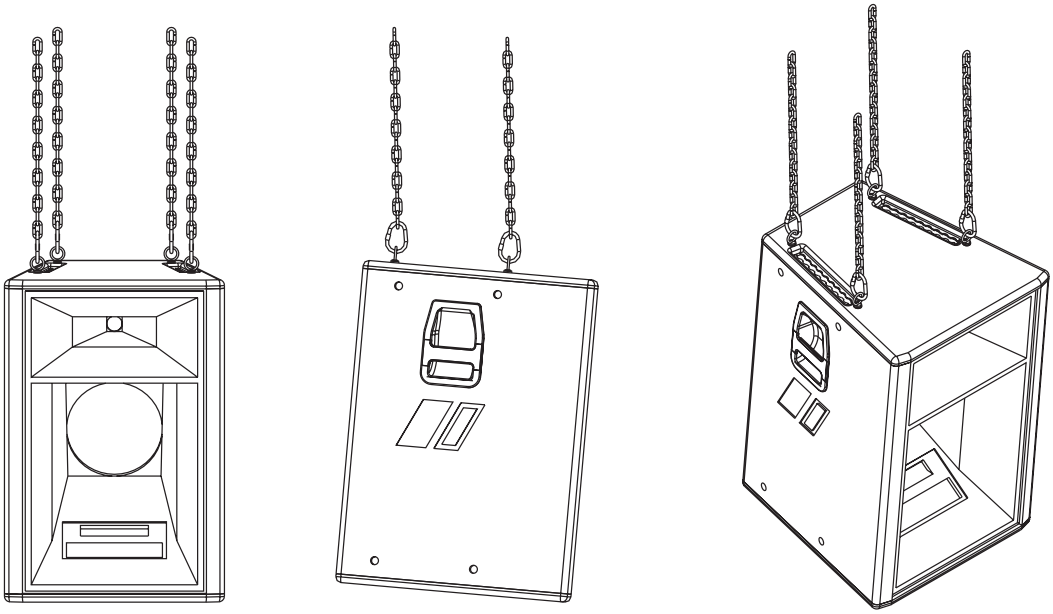
Each ANL-2 eyebolt has a rated working load of 200 kg. (440 lbs.). Each ANL-2 carabiner has a working load of 330 kg (726 lbs.). If using other hardware, make sure it is rated to handle the required load.

When using eyebolts it is important to bear in mind that the rated working load is only true for a load applied in the plane of the eye, and is significantly reduced for other angles. The drawing illustrates the concept. The table shows the variation of the working load as a function of the load angle. In the case of the ANL-2 eyebolt, this means that the 200 kg working load becomes 60 kg at 45 degrees. Do not use eyebolt flying if the load angle is higher than 45 degrees.

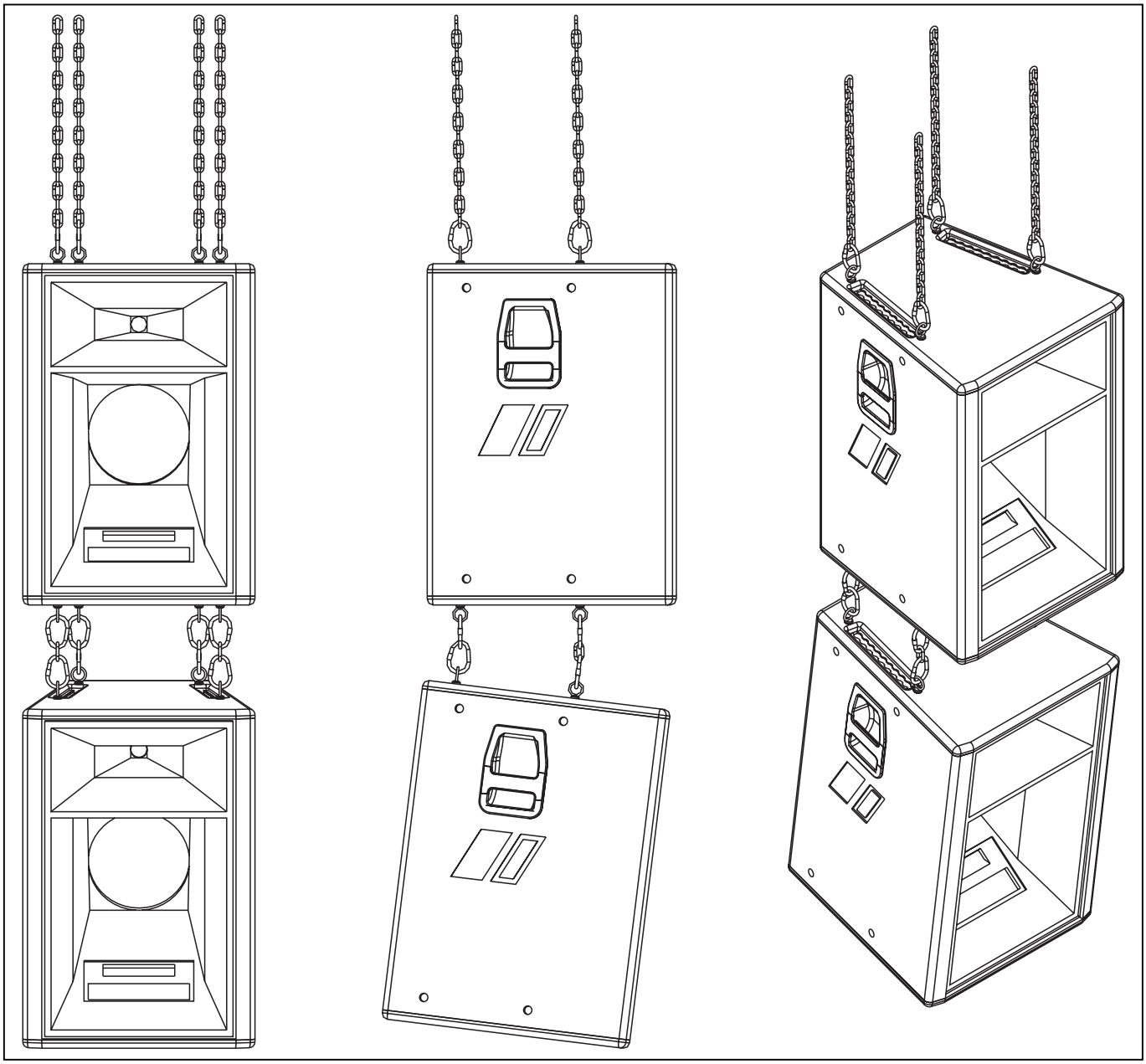
	0 degrees	30 degrees	45 degrees	More than 45 degrees
% Working Load	100%	65%	30%	25%



The following illustrations show different views on eyebolt flying for a single box. The length of the back cables or chains determines the vertical angle of the box.

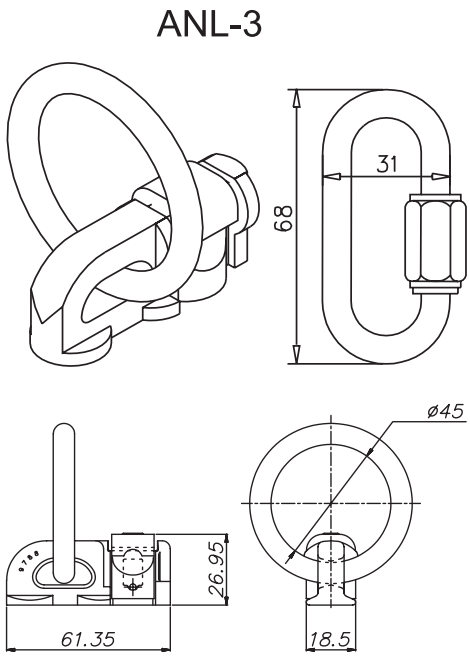


The following illustrations show different views on eyebolt flying for a two-box column.



4.3 Flying with AncraTrack

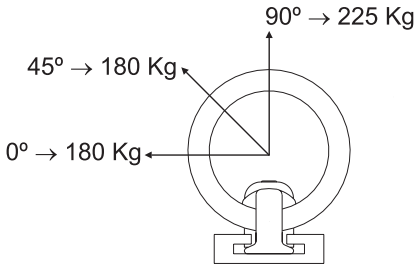
The optional ANL-3 set comprises one double-stud track connector with lifting ring and one carabiner that is available separately.



Each ANL-3 track connector has a rated working load of 225 kg. (495 lbs.). Each ANL-3 carabiner has a working load of 330 kg (726 lbs.). If using other hardware, make sure it is rated to handle the required load. Always ensure that the double-stud connector is well connected to the track by shaking the piece firmly.

When using track based rigging it is important to bear in mind that the rated working load is only true for a load applied in the plane of the eye, and changes for other angles. The drawing illustrates the concept. The table shows the variation of the working load as a function of the load angle.

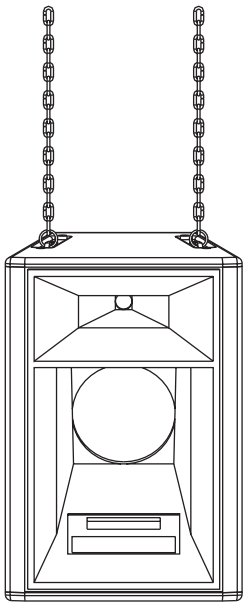
	0 degrees	45 degrees	90 degrees
% work load	100%	80%	80%

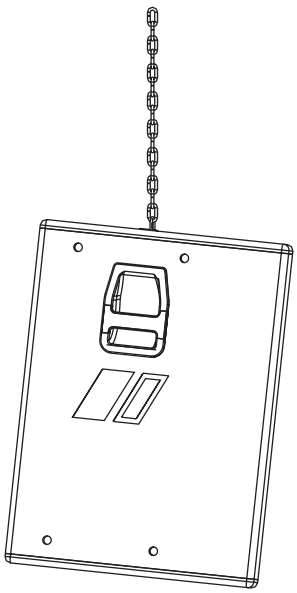


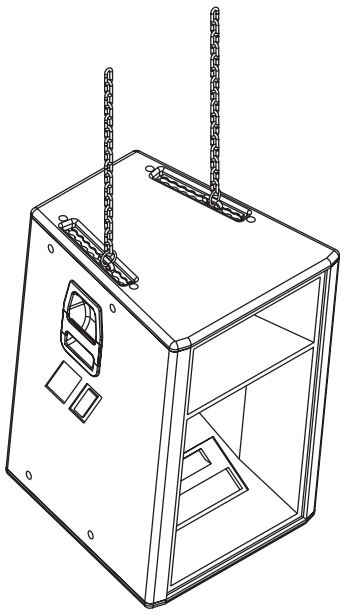
When using AncraTrack, the following vertical angles for the cabinet are obtained when connecting to the different track positions. The position relates to the hole number above which the ring is found. Position 1 is the closest to the front of the enclosure. Note that positions 1 and 9 mean that only one connector stud attaches to the track, as opposed to two for all angles in between. Use positions 1 and 9 for single enclosure flying only, or for flying the bottom speaker out of a column (typically for downfill applications). Negative angles denote downward pitch. Positive angles denote upward pitch.

Track hole number	ST-110	ST-112	ST-215
2	+13º	+5º	+6º
3	+8º	+1º	+3º
4	+3º	-2º	0º
5	0º	-6º	-3º
6	-5º	-10º	-6º
7	-10º	-14º	-9º
8	-13º	-17º	-12º
9	-17º	-20º	N/A

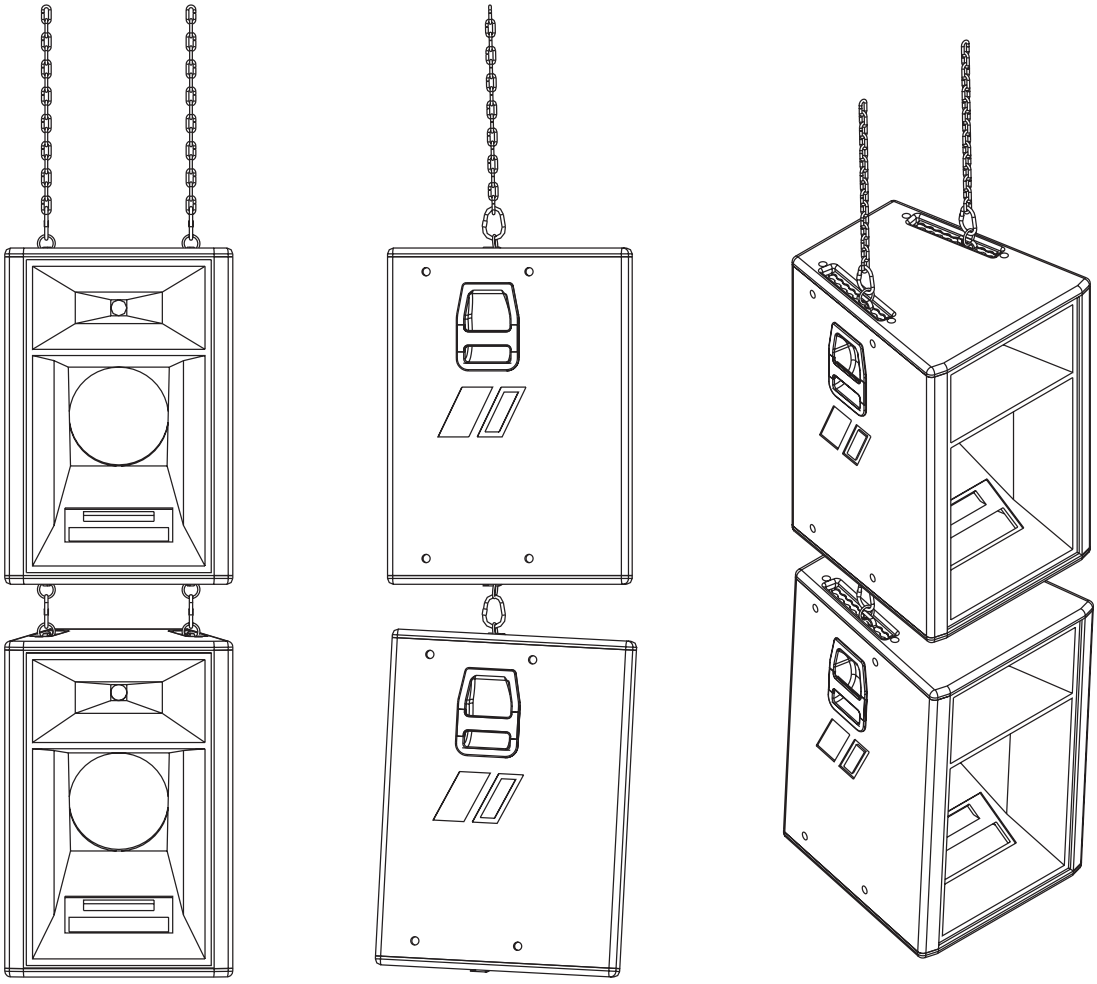
The following illustrations show different views on AncraTrack flying for a single box. The track position where the speaker is picked determines the vertical angle of the box.



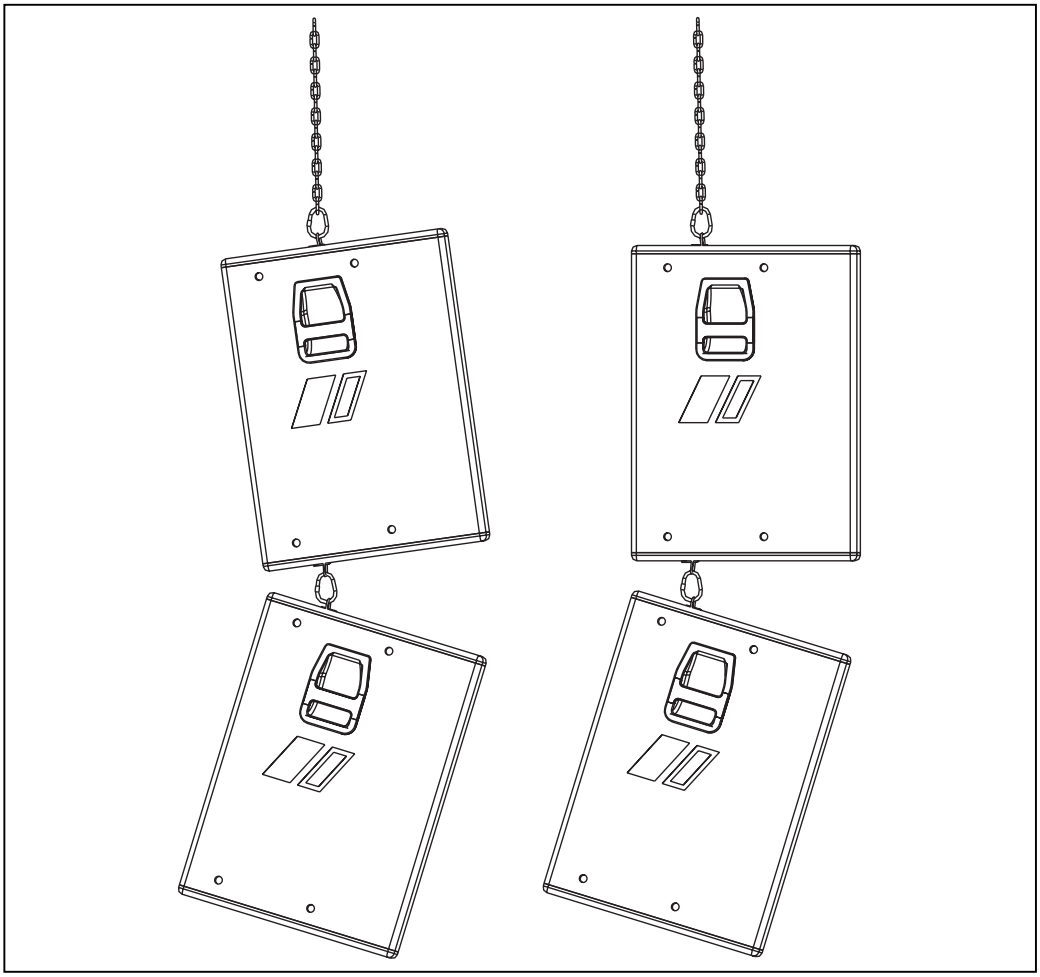




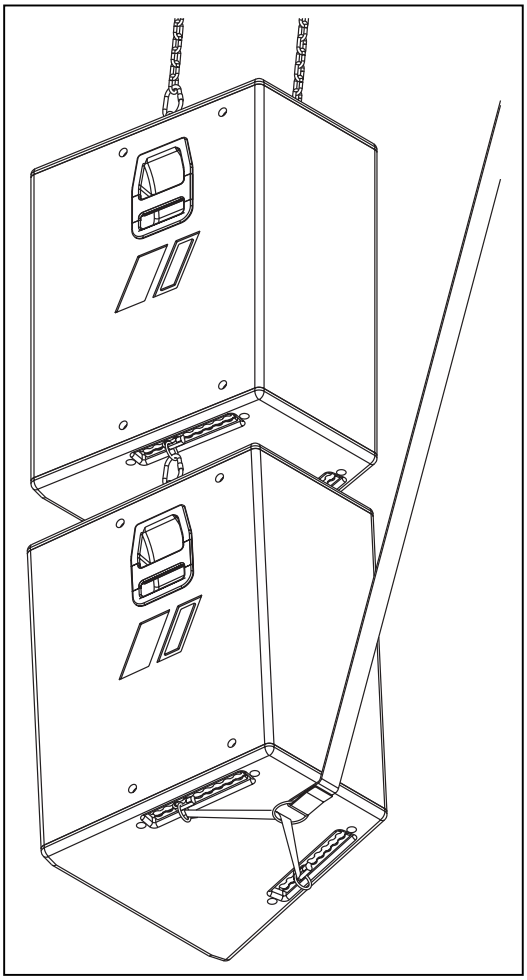
The following illustrations show different views on Ancra Track flying for a two-box column.



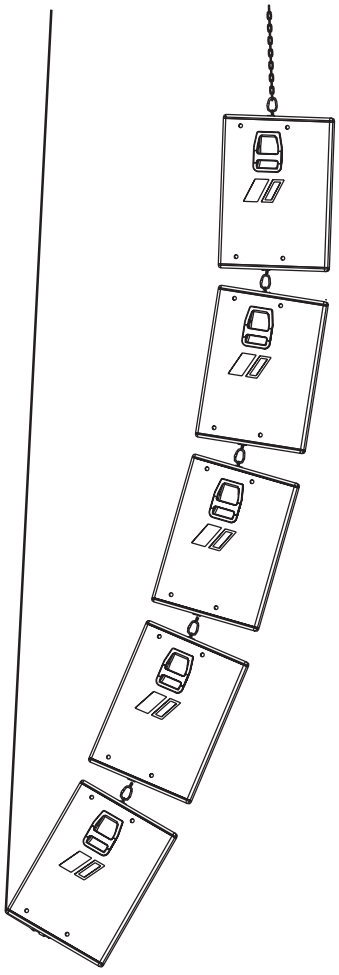
When flying a single box, its vertical angle is determined by the track position from which the speaker is picked. However, when other speakers fly from it, the angle varies. We can correct for this by moving the upper pick-up track position of the box. In the example shown on the illustration, the column on the left shows the upper box adopting a certain upward angle due to the box underneath, flying from it. The right-hand column shows how the box has been straightened by moving the upper pick-up track position on the top box backwards.



Occasionally a larger vertical splay may be looked for, particularly for the bottom box of a column. If this is the case, we can increase the vertical splay angle by pulling from the bottom box as seen on the illustration. In this case we have joined the two lower pick-up points of the bottom box with a nylon strap for a single pull-up point.



The illustration shows flying of an arc of boxes, using the lower flying points of the bottom box as our pull-up point to obtain the arc. The pull-up point needs to be behind the column's centre of gravity



4.4 Arraying

Ideally, only a super-high powered variable coverage speaker would be used per channel for covering any room. This not achievable in real life, so one must resort to arrays or clusters.
Speakers are arrayed for two reasons:

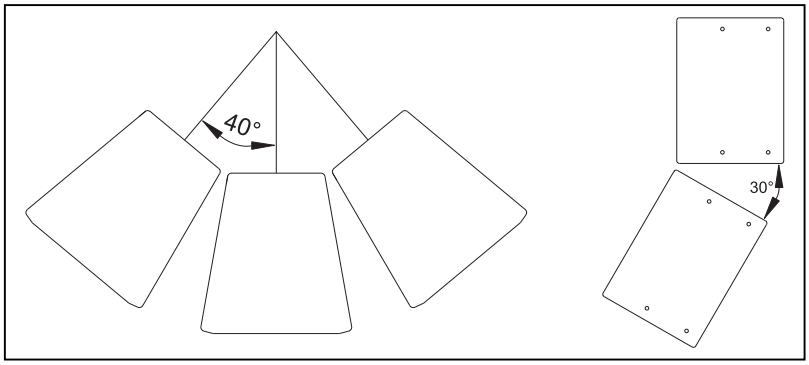
- To extend the coverage of a system that has too narrow directivity.
- To increase the sound pressure level.

The tables that follow offer directivity information for different tight-packed array combinations, separately for horizontal and vertical. - 6 dB coverage angle, directivity index (an expression of the directivity of an array, the more directive the higher) and on-axis SPL (relative to a single box) results are provided.

For every model, results are provided for a number of array boxes from 1 to 5, with splay angles from 0 to 50 degrees in 10-degree intervals. Results are for the 500 to 8kHz band, except for subs, where a one octave 100 Hz band is used.

[NA] The results are calculated from polars with two degree angular and 1/24th octave frequency resolution. Coverage angles from a single box may differ from those in the specifications section. Active mode was used in active/passive boxes. AUTOPOL, a platform consisting of custom and customised hardware and software, was used for automated high-resolution array predictions. Predictions for the 500-8k Hz band may overestimate the coverage angle which can reach lower values at specific frequencies.

Example. A 3x2 ST-112 array (3 columns and 2 rows) with 40-degree horizontal and 30 degree vertical splay (shown on the illustration).



To find out the coverage of such array, we go to the horizontal section of the ST-112 table and look for the 40º/3x cells, and the 30º/x2 cells on the vertical section. The results (cells have a grey background) show coverage angles of 165 degrees horizontal and 85 degrees vertical, and an on-axis SPL of +0 dB (horizontal) and +3 dB (vertical) for a total on-axis level of +3 dB (0 dB horizontal + 3 dB vertical) above the level for a single box.

R-112

Horizontal

Nr. of elements / Splay angle	1x			2x			3x			4x			5x		
variable	Angle	Di	SPL	Angle	Di	SPL	Angle	Di	SPL	Angle	Di	SPL	Angle	Di	SPL
0º	100º	9dB	0dB	90º	13dB	+5dB	65º	16dB	+8dB	30º	18dB	+10dB	15º	20dB	+11dB
10º				95º	13dB	+5dB	100º	13dB	+6dB	100º	13dB	+8dB	120º	11dB	+7dB
20º				105º	13dB	+5dB	125º	11dB	+5dB	145º	9dB	+5dB	160º	8dB	+5dB
30º				115º	12dB	+4dB	160º	8dB	+3dB	175º	8dB	+5dB	220º	5dB	+3dB
40º				130º	11dB	+4dB	190º	6dB	+2dB	210º	6dB	+4dB	275º	3dB	+2dB
50º				145º	10dB	+3dB	220º	4dB	+1dB	255º	6dB	+3dB	315º	2dB	+2dB

Vertical

Nr. of elements / Splay angle	x1			x2			x3			x4			x5		
variable	Angle	Di	SPL	Angle	Di	SPL	Angle	Di	SPL	Angle	Di	SPL	Angle	Di	SPL
0º	75º	10dB	0dB	70º	15dB	+5dB	30º	17dB	+8dB	25º	19dB	+10dB	15º	21dB	+11dB
10º				80º	14dB	+5dB	90º	13dB	+6dB	90º	13dB	+7dB	110º	11dB	+6dB
20º				90º	13dB	+4dB	120º	11dB	+4dB	135º	9dB	+4dB	165º	7dB	+4dB
30º				105º	12dB	+4dB	150º	8dB	+3dB	170º	7dB	+3dB	205º	5dB	+3dB
40º				125º	11dB	+3dB	185º	6dB	+2dB	205º	6dB	+3dB	270º	3dB	+2dB
50º				145º	9dB	+2dB	210º	5dB	+1dB	245º	5dB	+2dB	300º	3dB	+2dB

R-115

Horizontal

Nr. of elements / Splay angle	1x			2x			3x			4x			5x		
variable	Angle	Di	SPL	Angle	Di	SPL	Angle	Di	SPL	Angle	Di	SPL	Angle	Di	SPL
0º	95º	9dB	0dB	90º	14dB	+5dB	55º	16dB	+8dB	20º	18dB	+10dB	15º	20dB	+11dB
10º				95º	13dB	+5dB	100º	13dB	+6dB	105º	12dB	+7dB	120º	11dB	+6dB
20º				100º	13dB	+5dB	130º	10dB	+4dB	145º	9dB	+5dB	165º	8dB	+5dB
30º				110º	12dB	+4dB	160º	8dB	+3dB	170º	8dB	+4dB	215º	5dB	+3dB
40º				125º	11dB	+3dB	185º	6dB	+2dB	205º	7dB	+4dB	260º	3dB	+2dB
50º				145º	10dB	+3dB	215º	4dB	+1dB	250º	5dB	+3dB	315º	2dB	+1dB

Vertical

Nr. of elements / Splay angle	x1			x2			x3			x4			x5		
variable	Angle	Di	SPL	Angle	Di	SPL	Angle	Di	SPL	Angle	Di	SPL	Angle	Di	SPL

R-115

0º	75º	11dB	0dB	60º	15dB	5dB	30º	18dB	8dB	20º	20dB	10dB	10º	22dB	11dB
10º				70º	15dB	5dB	85º	14dB	6dB	95º	13dB	7dB	105º	12dB	6dB
20º				85º	14dB	4dB	125º	10dB	3dB	135º	10dB	4dB	165º	7dB	3dB
30º				110º	12dB	3dB	150º	8dB	2dB	175º	7dB	3dB	205º	5dB	3dB
40º				125º	10dB	2dB	175º	6dB	1dB	205º	5dB	2dB	255º	4dB	2dB
50º				140º	9dB	2dB	205º	4dB	0dB	245º	5dB	2dB	300º	2dB	1dB

R-212

Horizontal

Nr. of elements / Splay angle	1x			2x			3x			4x			5x		
variable	Angle	Di	SPL	Angle	Di	SPL	Angle	Di	SPL	Angle	Di	SPL	Angle	Di	SPL
0º	100º	8dB	0dB	90º	13dB	+5dB	45º	15dB	+8dB	25º	17dB	+10dB	20º	19dB	+12dB
10º				100º	12dB	+5dB	105º	13dB	+7dB	105º	13dB	+8dB	125º	11dB	+8dB
20º				110º	12dB	+5dB	130º	11dB	+6dB	155º	9dB	+5dB	170º	8dB	+5dB
30º				125º	11dB	+5dB	160º	8dB	+4dB	185º	7dB	+4dB	215º	6dB	+4dB
40º				135º	11dB	+4dB	210º	5dB	+2dB	210º	6dB	+4dB	285º	3dB	+3dB
50º				155º	10dB	+3dB	240º	3dB	+1dB	265º	6dB	+4dB	335º	1dB	+2dB

Vertical

Nr. of elements / Splay angle	x1			x2			x3			x4			x5		
variable	Angle	Di	SPL	Angle	Di	SPL	Angle	Di	SPL	Angle	Di	SPL	Angle	Di	SPL
0º	60º	11dB	0dB	50º	15dB	+5dB	30º	17dB	+8dB	25º	19dB	+10dB	15º	21dB	+12dB
10º				65º	14dB	+5dB	60º	14dB	+6dB	80º	14dB	+7dB	115º	12dB	+7dB
20º				105º	12dB	+4dB	130º	10dB	+4dB	150º	9dB	+4dB	170º	8dB	+4dB
30º				145º	10dB	+2dB	185º	7dB	+2dB	190º	7dB	+2dB	200º	6dB	+3dB
40º				175º	8dB	+0dB	220º	5dB	+0dB	215º	5dB	+1dB	285º	4dB	+2dB
50º				190º	7dB	-1dB	230º	4dB	+0dB	275º	4dB	+1dB	325º	2dB	+1dB

R-214

Horizontal

Nr. of elements / Splay angle	1x			2x			3x			4x			5x		
variable	Angle	Di	SPL	Angle	Di	SPL	Angle	Di	SPL	Angle	Di	SPL	Angle	Di	SPL
0º	85º	10dB	0dB	75º	15dB	+5dB	30º	17dB	+8dB	20º	19dB	+10dB	15º	21dB	+12dB
10º				85º	14dB	+5dB	90º	14dB	+6dB	100º	13dB	+7dB	115º	11dB	+6dB
20º				95º	13dB	+5dB	120º	11dB	+4dB	140º	9dB	+5dB	160º	8dB	+4dB
30º				110º	12dB	+4dB	160º	8dB	+2dB	175º	8dB	+4dB	215º	5dB	+3dB
40º				125º	11dB	+3dB	190º	6dB	+1dB	200º	6dB	+3dB	260º	3dB	+2dB
50º				145º	10dB	+2dB	215º	4dB	+0dB	240º	5dB	+3dB	315º	2dB	+1dB

Vertical

Nr. of elements / Splay angle	x1			x2			x3			x4			x5		
variable	Angle	Di	SPL	Angle	Di	SPL	Angle	Di	SPL	Angle	Di	SPL	Angle	Di	SPL
0º	45º	13dB	0dB	40º	17dB	+5dB	30º	20dB	+8dB	15º	21dB	+10dB	15º	23dB	+11dB
10º				55º	16dB	+5dB	60º	15dB	+6dB	75º	14dB	+6dB	85º	13dB	+6dB
20º				70º	14dB	+3dB	105º	11dB	+3dB	120º	10dB	+4dB	140º	8dB	+3dB
30º				95º	12dB	+2dB	140º	8dB	+1dB	155º	8dB	+2dB	200º	5dB	+1dB
40º				120º	9dB	+0dB	165º	7dB	+1dB	200º	5dB	+1dB	250º	4dB	+1dB
50º				145º	7dB	-2dB	185º	6dB	+0dB	255º	3dB	-1dB	280º	3dB	+1dB

R-215

Horizontal

Nr. of elements / Splay angle	1x			2x			3x			4x			5x		
variable	Angle	Di	SPL	Angle	Di	SPL	Angle	Di	SPL	Angle	Di	SPL	Angle	Di	SPL
0º	90º	9dB	0dB	85º	14dB	+5dB	60º	16dB	+8dB	25º	18dB	+10dB	15º	20dB	+11dB
10º				90º	13dB	+5dB	95º	13dB	+6dB	105º	13dB	+7dB	115º	11dB	+7dB
20º				100º	13dB	+5dB	120º	11dB	+5dB	145º	9dB	+5dB	160º	8dB	+5dB
30º				115º	12dB	+4dB	155º	8dB	+3dB	175º	7dB	+4dB	205º	6dB	+4dB
40º				125º	11dB	+4dB	195º	5dB	+1dB	200º	7dB	+4dB	260º	2dB	+2dB
50º				140º	10dB	+3dB	225º	3dB	+0dB	230º	6dB	+3dB	325º	1dB	+1dB

Vertical

R-215

Nr. of elements / Splay angle	x1			x2			x3			x4			x5		
variable	Angle	Di	SPL	Angle	Di	SPL	Angle	Di	SPL	Angle	Di	SPL	Angle	Di	SPL
0º	50º	12dB	0dB	45º	17dB	+5dB	30º	19dB	+7dB	20º	21dB	+9dB	15º	23dB	+11dB
10º				55º	16dB	+4dB	60º	15dB	+5dB	70º	14dB	+6dB	85º	13dB	+6dB
20º				65º	14dB	+4dB	105º	11dB	+3dB	125º	10dB	+4dB	150º	8dB	+3dB
30º				95º	12dB	+2dB	145º	8dB	+1dB	160º	7dB	+2dB	200º	5dB	+2dB
40º				115º	10dB	+1dB	170º	6dB	+0dB	195º	6dB	+1dB	250º	3dB	+1dB
50º				135º	8dB	-1dB	195º	5dB	+0dB	225º	4dB	+0dB	285º	2dB	+0dB

SUB-18R

Horizontal

Nr. of elements / Splay angle	1x			2x			3x			4x			5x		
variable	Angle	Di	SPL	Angle	Di	SPL	Angle	Di	SPL	Angle	Di	SPL	Angle	Di	SPL
0º	360º	1dB	+0dB	360º	3dB	+6dB	360º	5dB	+10dB	250º	6dB	+12dB	110º	9dB	+14dB
10º				360º	4dB	+6dB	360º	5dB	+9dB	130º	7dB	+12dB	95º	10dB	+14dB
20º				360º	4dB	+6dB	260º	6dB	+9dB	115º	8dB	+12dB	90º	9dB	+13dB
30º				360º	4dB	+6dB	255º	6dB	+9dB	110º	8dB	+11dB	95º	8dB	+12dB
40º				360º	4dB	+6dB	255º	6dB	+9dB	115º	7dB	+10dB	110º	7dB	+10dB
50º				360º	4dB	+6dB	255º	6dB	+8dB	125º	6dB	+9dB	130º	5dB	+8dB

Vertical

Nr. of elements / Splay angle	x1			x2			x3			x4			x5		
variable	Angle	Di	SPL	Angle	Di	SPL	Angle	Di	SPL	Angle	Di	SPL	Angle	Di	SPL
0º	360º	1dB	+0dB	360º	3dB	+6dB	360º	5dB	+10dB	250º	6dB	+12dB	110º	9dB	+14dB
10º				360º	4dB	+6dB	360º	5dB	+9dB	130º	7dB	+12dB	95º	10dB	+14dB
20º				360º	4dB	+6dB	260º	6dB	+9dB	115º	8dB	+12dB	90º	9dB	+13dB
30º				360º	4dB	+6dB	255º	6dB	+9dB	110º	8dB	+11dB	95º	8dB	+11dB
40º				360º	4dB	+6dB	255º	6dB	+9dB	115º	7dB	+10dB	110º	7dB	+10dB
50º				360º	4dB	+6dB	255º	6dB	+8dB	125º	6dB	+9dB	130º	5dB	+8dB

SUB-218

Horizontal

Nr. of elements / Splay angle	1x			2x			3x			4x			5x		
variable	Angle	Di	SPL	Angle	Di	SPL	Angle	Di	SPL	Angle	Di	SPL	Angle	Di	SPL
0º	360º	1dB	+0dB	360º	4dB	+6dB	360º	5dB	+10dB	135º	7dB	+12dB	100º	10dB	+14dB
10º				360º	4dB	+6dB	260º	6dB	+9dB	115º	9dB	+12dB	85º	10dB	+14dB
20º				360º	4dB	+6dB	155º	7dB	+9dB	105º	9dB	+11dB	85º	10dB	+13dB
30º				360º	5dB	+6dB	140º	7dB	+9dB	100º	9dB	+11dB	90º	9dB	+11dB
40º				360º	5dB	+6dB	130º	7dB	+9dB	100º	8dB	+10dB	105º	7dB	+9dB
50º				360º	5dB	+6dB	125º	7dB	+8dB	110º	7dB	+8dB	120º	5dB	+7dB

Vertical

Nr. of elements / Splay angle	x1			x2			x3			x4			x5		
variable	Angle	Di	SPL	Angle	Di	SPL	Angle	Di	SPL	Angle	Di	SPL	Angle	Di	SPL
0º	360º	1dB	+0dB	360º	4dB	+6dB	360º	5dB	+10dB	135º	7dB	+12dB	100º	10dB	+14dB
10º				360º	4dB	+6dB	260º	6dB	+9dB	115º	9dB	+12dB	85º	10dB	+14dB
20º				360º	4dB	+6dB	155º	7dB	+9dB	105º	9dB	+11dB	85º	10dB	+13dB
30º				360º	5dB	+6dB	140º	7dB	+9dB	100º	9dB	+11dB	90º	9dB	+11dB
40º				360º	5dB	+6dB	130º	7dB	+9dB	100º	8dB	+10dB	105º	7dB	+9dB
50º				360º	5dB	+6dB	125º	7dB	+8dB	110º	7dB	+8dB	120º	5dB	+7dB

ST-015

Horizontal

Nr. of elements / Splay angle	1x			2x			3x		
variable	Angle	Di	SPL	Angle	Di	SPL	Angle	Di	SPL
0º	90º	10dB	+0dB	40º	14dB	+5dB	10º	17dB	+8dB
10º				40º	14dB	+5dB	45º	13dB	+6dB
20º				45º	13dB	+5dB	90º	10dB	+4dB
30º				70º	12dB	+4dB	120º	7dB	+2dB
40º				85º	11dB	+3dB	155º	5dB	+1dB

ST-015

50º				105º	10dB	+3dB	175º	5dB	+1dB	

Vertical

Nr. of elements / Splay angle	x1			x2			x3			
variable	Angle	Di	SPL	Angle	Di	SPL	Angle	Di	SPL	
0º	65º	11dB	+0dB	25º	15dB	+5dB	10º	18dB	+8dB	
10º				35º	14dB	+4dB	45º	13dB	+5dB	
20º				55º	12dB	+3dB	80º	10dB	+4dB	
30º				65º	11dB	+3dB	120º	7dB	+2dB	
40º				75º	11dB	+3dB	150º	6dB	+1dB	
50º				55º	9dB	+2dB	165º	5dB	+1dB	

ST-15

Horizontal

Nr. of elements / Splay angle	1x			2x			3x			4x			5x		
variable	Angle	Di	SPL	Angle	Di	SPL	Angle	Di	SPL	Angle	Di	SPL	Angle	Di	SPL
0º	100º	9dB	0dB	90º	13dB	+5dB	55º	16dB	+8dB	25º	18dB	+10dB	15º	19dB	+11dB
10º				95º	13dB	+5dB	105º	13dB	+6dB	100º	13dB	+8dB	120º	11dB	+7dB
20º				105º	13dB	+5dB	125º	11dB	+6dB	145º	9dB	+5dB	160º	8dB	+5dB
30º				115º	12dB	+4dB	155º	8dB	+3dB	175º	8dB	+4dB	210º	6dB	+4dB
40º				130º	11dB	+4dB	205º	5dB	+1dB	200º	7dB	+4dB	280º	3dB	+2dB
50º				145º	10dB	+3dB	225º	3dB	+1dB	245º	6dB	+3dB	325º	2dB	+1dB

Vertical

Nr. of elements / Splay angle	x1			x2			x3			x4			x5		
variable	Angle	Di	SPL	Angle	Di	SPL	Angle	Di	SPL	Angle	Di	SPL	Angle	Di	SPL
0º	85º	9dB	0dB	75º	14dB	+5dB	35º	17dB	+8dB	25º	19dB	+10dB	15º	20dB	+11dB
10º				85º	14dB	+5dB	100º	13dB	+6dB	100º	13dB	+7dB	120º	11dB	+7dB
20º				100º	13dB	+5dB	130º	11dB	+5dB	145º	9dB	+5dB	175º	7dB	+4dB
30º				120º	11dB	+4dB	165º	8dB	+3dB	190º	7dB	+3dB	210º	5dB	+4dB
40º				140º	10dB	+3dB	200º	5dB	+1dB	210º	6dB	+3dB	275º	3dB	+2dB
50º				160º	9dB	+2dB	225º	4dB	+0dB	270º	5dB	+3dB	325º	2dB	+1dB

ST-18

Horizontal

Nr. of elements / Splay angle	1x			2x			3x			4x			5x		
variable	Angle	Di	SPL	Angle	Di	SPL	Angle	Di	SPL	Angle	Di	SPL	Angle	Di	SPL
0º	360º	1dB	+0dB	360º	4dB	+6dB	275º	5dB	+10dB	150º	7dB	+12dB	110º	9dB	+14dB
10º				360º	5dB	+6dB	175º	6dB	+10dB	115º	9dB	+12dB	90º	11dB	+14dB
20º				360º	5dB	+6dB	140º	7dB	+9dB	100º	10dB	+12dB	85º	11dB	+13dB
30º				280º	6dB	+6dB	120º	8dB	+9dB	90º	10dB	+11dB	85º	9dB	+11dB
40º				270º	6dB	+6dB	110º	9dB	+9dB	90º	9dB	+9dB	110º	5dB	+8dB
50º				265º	6dB	+6dB	105º	9dB	+8dB	100º	7dB	+7dB	360º	3dB	+5dB

Vertical

Nr. of elements / Splay angle	x1			x2			x3			x4			x5		
variable	Angle	Di	SPL	Angle	Di	SPL	Angle	Di	SPL	Angle	Di	SPL	Angle	Di	SPL
0º	360º	1dB	+0dB	360º	4dB	+6dB	275º	6dB	+10dB	145º	7dB	+12dB	105º	9dB	+14dB
10º				360º	5dB	+6dB	165º	7dB	+10dB	110º	9dB	+12dB	85º	11dB	+14dB
20º				285º	5dB	+6dB	135º	8dB	+9dB	95º	10dB	+11dB	80º	11dB	+13dB
30º				275º	6dB	+6dB	115º	9dB	+9dB	90º	10dB	+10dB	85º	9dB	+11dB
40º				265º	6dB	+6dB	105º	9dB	+9dB	90º	9dB	+9dB	230º	5dB	+7dB
50º				260º	7dB	+6dB	95º	9dB	+8dB	95º	6dB	+7dB	360º	2dB	+5dB

ST-32

Horizontal

Nr. of elements / Splay angle	1x			2x			3x			4x			5x		
variable	Angle	Di	SPL	Angle	Di	SPL	Angle	Di	SPL	Angle	Di	SPL	Angle	Di	SPL
0º	85º	10dB	0dB	75º	15dB	+5dB	40º	17dB	+8dB	25º	19dB	+9dB	10º	21dB	+11dB
10º				80º	14dB	+4dB	100º	12dB	+5dB	100º	13dB	+6dB	125º	10dB	+6dB
20º				95º	13dB	+4dB	125º	10dB	+4dB	140º	9dB	+4dB	160º	8dB	+5dB

ST-32

30º				110º	12dB	+3dB	160º	7dB	+2dB	175º	8dB	+4dB	210º	5dB	+3dB
40º				125º	11dB	+2dB	185º	6dB	+1dB	200º	7dB	+3dB	255º	3dB	+2dB
50º				140º	9dB	+2dB	210º	5dB	+1dB	230º	5dB	+2dB	315º	2dB	+1dB

Vertical

Nr. of elements / Splay angle	x1			x2			x3			x4			x5		
variable	Angle	Di	SPL	Angle	Di	SPL	Angle	Di	SPL	Angle	Di	SPL	Angle	Di	SPL
0º	85º	10dB	0dB	75º	15dB	+5dB	40º	17dB	+8dB	25º	19dB	+9dB	10º	21dB	+11dB
10º				80º	14dB	+4dB	95º	12dB	+5dB	95º	13dB	+6dB	125º	10dB	+6dB
20º				95º	13dB	+4dB	125º	10dB	+4dB	135º	10dB	+4dB	160º	8dB	+5dB
30º				110º	12dB	+3dB	155º	8dB	+2dB	170º	8dB	+4dB	205º	5dB	+3dB
40º				120º	11dB	+2dB	185º	6dB	+1dB	200º	7dB	+3dB	255º	3dB	+2dB
50º				135º	10dB	+2dB	210º	5dB	+1dB	230º	6dB	+2dB	315º	2dB	+1dB

ST-110

Horizontal

Nr. of elements / Splay angle	1x			2x			3x			4x			5x		
variable	Angle	Di	SPL	Angle	Di	SPL	Angle	Di	SPL	Angle	Di	SPL	Angle	Di	SPL
0º	80º	10dB	+0dB	75º	15dB	+5dB	45º	17dB	+8dB	20º	19dB	+10dB	10º	21dB	+11dB
10º				80º	14dB	+5dB	85º	14dB	+6dB	100º	13dB	+7dB	110º	12dB	+6dB
20º				90º	14dB	+5dB	120º	11dB	+4dB	135º	10dB	+5dB	155º	8dB	+4dB
30º				100º	12dB	+4dB	145º	8dB	+2dB	165º	8dB	+4dB	205º	5dB	+3dB
40º				120º	11dB	+3dB	185º	5dB	+1dB	195º	7dB	+3dB	260º	3dB	+1dB
50º				135º	10dB	+2dB	210º	4dB	+0dB	230º	6dB	+3dB	315º	1dB	+0dB

Vertical

Nr. of elements / Splay angle	x1			x2			x3			x4			x5		
variable	Angle	Di	SPL	Angle	Di	SPL	Angle	Di	SPL	Angle	Di	SPL	Angle	Di	SPL
0º	75º	10dB	+0dB	65º	14dB	+5dB	35º	17dB	+8dB	25º	19dB	+10dB	15º	21dB	+12dB
10º				65º	14dB	+5dB	80º	14dB	+7dB	100º	13dB	+7dB	110º	12dB	+7dB
20º				80º	13dB	+5dB	130º	10dB	+4dB	140º	9dB	+5dB	175º	6dB	+3dB
30º				115º	12dB	+4dB	160º	7dB	+2dB	180º	7dB	+3dB	210º	5dB	+3dB
40º				135º	10dB	+3dB	200º	5dB	+1dB	205º	6dB	+3dB	270º	3dB	+2dB
50º				155º	8dB	+2dB	220º	4dB	+0dB	255º	4dB	+2dB	325º	2dB	+1dB

ST-112

Horizontal

Nr. of elements / Splay angle	1x			2x			3x			4x			5x		
variable	Angle	Di	SPL	Angle	Di	SPL	Angle	Di	SPL	Angle	Di	SPL	Angle	Di	SPL
0º	60º	13dB	+0dB	45º	18dB	+5dB	35º	20dB	+8dB	20º	22dB	+10dB	10º	24dB	+11dB
10º				55º	17dB	+5dB	60º	16dB	+5dB	70º	15dB	+6dB	85º	13dB	+6dB
20º				65º	15dB	+4dB	100º	12dB	+3dB	110º	11dB	+4dB	145º	7dB	+2dB
30º				80º	13dB	+3dB	135º	8dB	+1dB	155º	8dB	+2dB	185º	5dB	+2dB
40º				105º	11dB	+1dB	165º	5dB	+0dB	185º	6dB	+1dB	245º	3dB	+0dB
50º				125º	9dB	+0dB	190º	4dB	-1dB	220º	4dB	+0dB	275º	2dB	+0dB

Vertical

Nr. of elements / Splay angle	x1			x2			x3			x4			x5		
variable	Angle	Di	SPL	Angle	Di	SPL	Angle	Di	SPL	Angle	Di	SPL	Angle	Di	SPL
0º	55º	13dB	+0dB	45º	17dB	+5dB	30º	20dB	+8dB	20º	22dB	+9dB	15º	24dB	+11dB
10º				50º	17dB	+5dB	60º	15dB	+5dB	70º	14dB	+6dB	85º	13dB	+6dB
20º				65º	15dB	+4dB	100º	11dB	+3dB	115º	11dB	+4dB	150º	7dB	+2dB
30º				85º	13dB	+3dB	135º	8dB	+1dB	155º	7dB	+2dB	185º	5dB	+2dB
40º				110º	11dB	+1dB	170º	5dB	+0dB	190º	5dB	+1dB	240º	3dB	+1dB
50º				135º	8dB	+0dB	195º	4dB	-1dB	235º	4dB	+0dB	280º	1dB	+0dB

ST-215

Horizontal

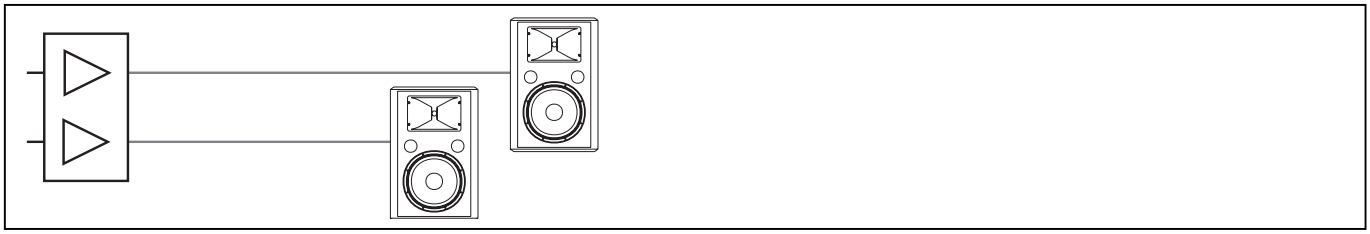
Nr. of elements / Splay angle	1x			2x			3x			4x			5x		
variable	Angle	Di	SPL	Angle	Di	SPL	Angle	Di	SPL	Angle	Di	SPL	Angle	Di	SPL
0º	60º	13dB	0dB	45º	18dB	+4dB	25º	20dB	+7dB	15º	22dB	+9dB	10º	24dB	+10dB

ST-215															
10º				55º	17dB	+4dB	75º	15dB	+5dB	75º	15dB	+5dB	95º	12dB	+5dB
20º				65º	15dB	+3dB	100º	12dB	+3dB	115º	10dB	+3dB	140º	8dB	+3dB
30º				90º	13dB	+2dB	135º	8dB	+1dB	150º	8dB	+2dB	190º	5dB	+1dB
40º				110º	11dB	+1dB	160º	6dB	+0dB	190º	6dB	+1dB	245º	3dB	+0dB
50º				130º	8dB	-1dB	175º	6dB	+0dB	225º	4dB	-1dB	275º	3dB	+0dB
Vertical															
Nr. of elements / Splay angle	x1			x2			x3			x4			x5		
variable	Angle	Di	SPL	Angle	Di	SPL	Angle	Di	SPL	Angle	Di	SPL	Angle	Di	SPL
0º	55º	14dB	0dB	45º	17dB	+4dB	25º	20dB	+7dB	15º	22dB	+9dB	10º	23dB	+10dB
10º				50º	16dB	+4dB	75º	14dB	+4dB	70º	15dB	+5dB	95º	12dB	+5dB
20º				70º	14dB	+3dB	100º	11dB	+3dB	115º	11dB	+3dB	135º	8dB	+3dB
30º				95º	12dB	+1dB	140º	8dB	+1dB	155º	8dB	+1dB	200º	5dB	+1dB
40º				115º	10dB	-1dB	160º	7dB	+0dB	190º	6dB	+0dB	245º	3dB	+0dB
50º				135º	8dB	-2dB	170º	7dB	+1dB	225º	3dB	-2dB	270º	4dB	+1dB

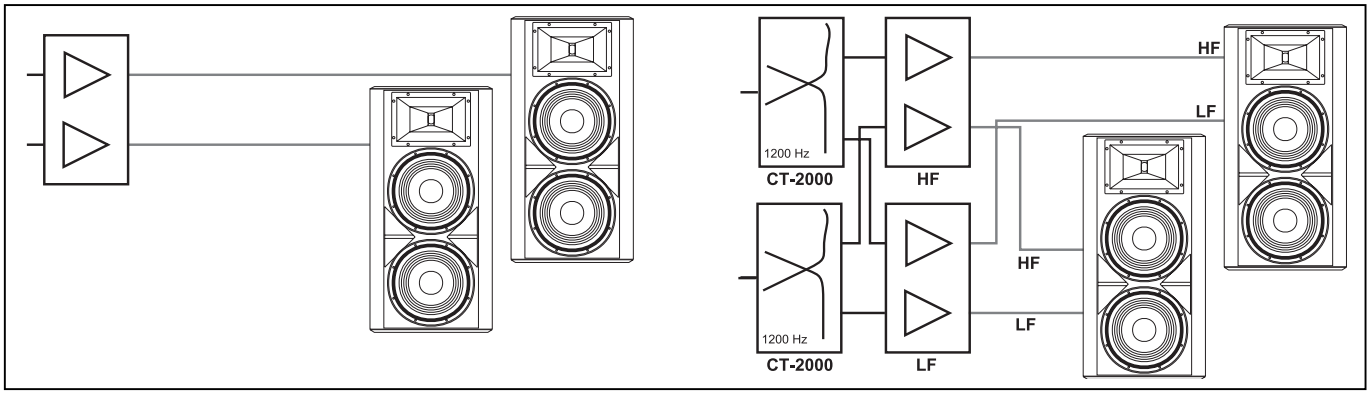
ST-218															
Horizontal															
Nr. of elements / Splay angle	1x			2x			3x			4x			5x		
variable	Angle	Di	SPL	Angle	Di	SPL	Angle	Di	SPL	Angle	Di	SPL	Angle	Di	SPL
0º	360º	1dB	+0dB	265º	5dB	+6dB	130º	8dB	+10dB	95º	10dB	+12dB	75º	12dB	+14dB
10º				260º	6dB	+6dB	110º	9dB	+9dB	80º	12dB	+12dB	60º	13dB	+14dB
20º				165º	7dB	+6dB	90º	10dB	+9dB	70º	12dB	+11dB	70º	11dB	+12dB
30º				135º	8dB	+6dB	80º	11dB	+9dB	70º	10dB	+10dB	360º	7dB	+8dB
40º				125º	8dB	+6dB	75º	11dB	+8dB	215º	7dB	+7dB	360º	1dB	+4dB
50º				115º	9dB	+5dB	75º	10dB	+7dB	360º	3dB	+4dB	330º	-1dB	+2dB
Vertical															
Nr. of elements / Splay angle	x1			x2			x3			x4			x5		
variable	Angle	Di	SPL	Angle	Di	SPL	Angle	Di	SPL	Angle	Di	SPL	Angle	Di	SPL
0º	360º	2dB	+0dB	265º	6dB	+6dB	130º	8dB	+10dB	90º	11dB	+12dB	75º	13dB	+14dB
10º				185º	7dB	+6dB	105º	10dB	+9dB	75º	12dB	+12dB	60º	13dB	+13dB
20º				155º	7dB	+6dB	90º	11dB	+9dB	70º	12dB	+11dB	65º	11dB	+12dB
30º				135º	8dB	+6dB	80º	11dB	+9dB	70º	10dB	+9dB	360º	7dB	+8dB
40º				120º	8dB	+6dB	75º	11dB	+8dB	215º	7dB	+7dB	360º	2dB	+4dB
50º				115º	9dB	+5dB	70º	10dB	+6dB	360º	3dB	+3dB	325º	-1dB	+3dB

5.1 Stereo full-range

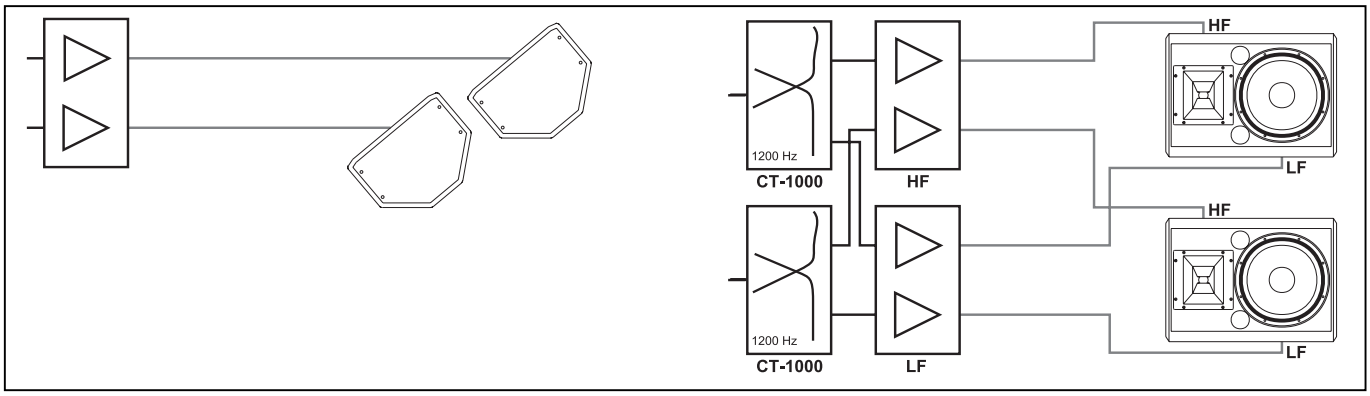
R-112/R-115/R-214



R-215 in active or passive mode. Controller CT-2000 can also be exchanged for CT-1000 for the active mode.

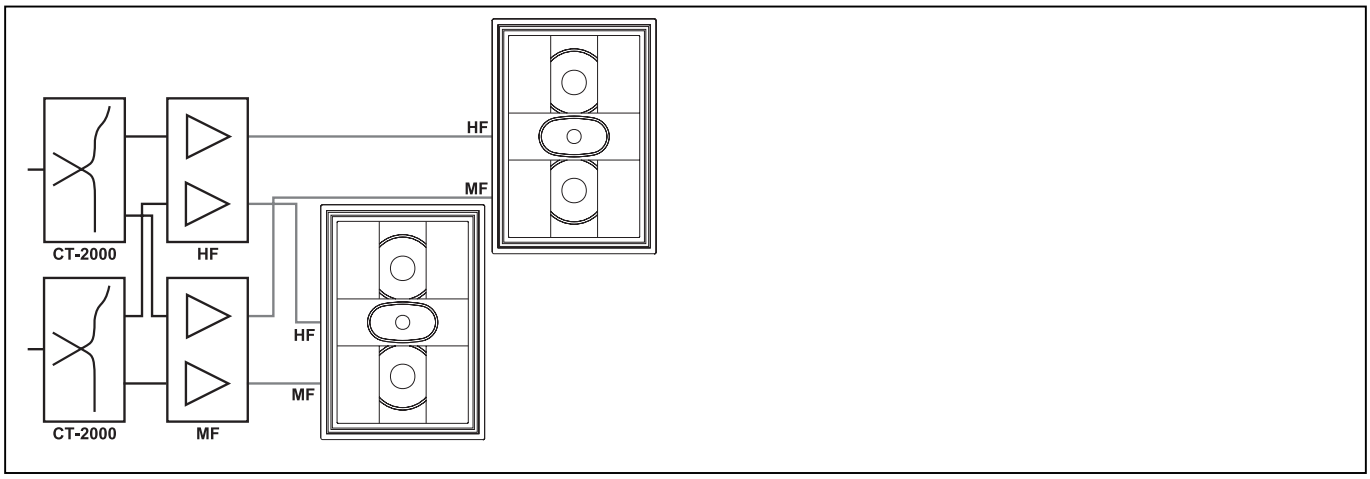


ST-15. As a monitor wedge, the ST-15 can be used as a stand-alone enclosure in active or passive modes.



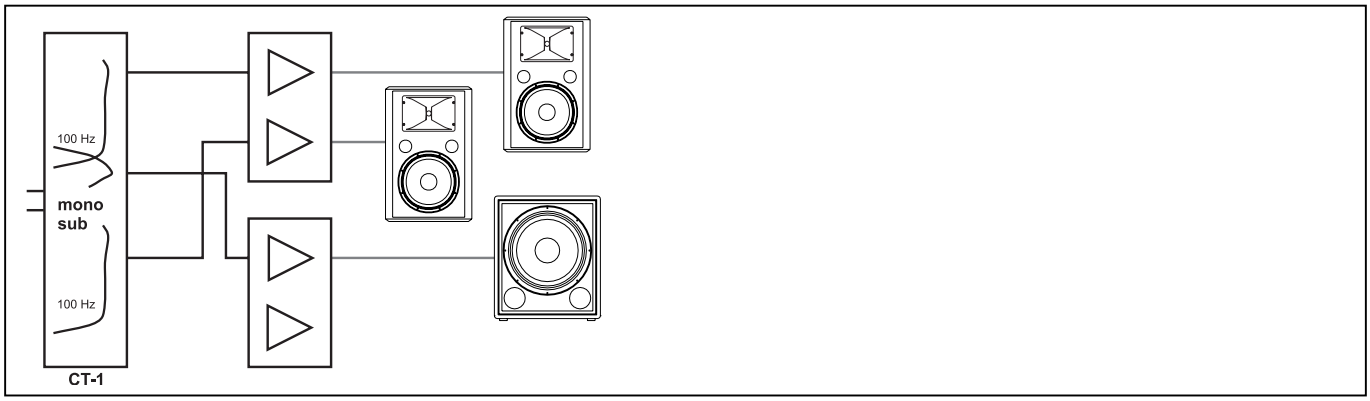
ST-015, ST-32

ST-215. The ST-215 will normally be used in combination with subwoofers. However, for speech-only applications it can be used as a stand-alone enclosure.



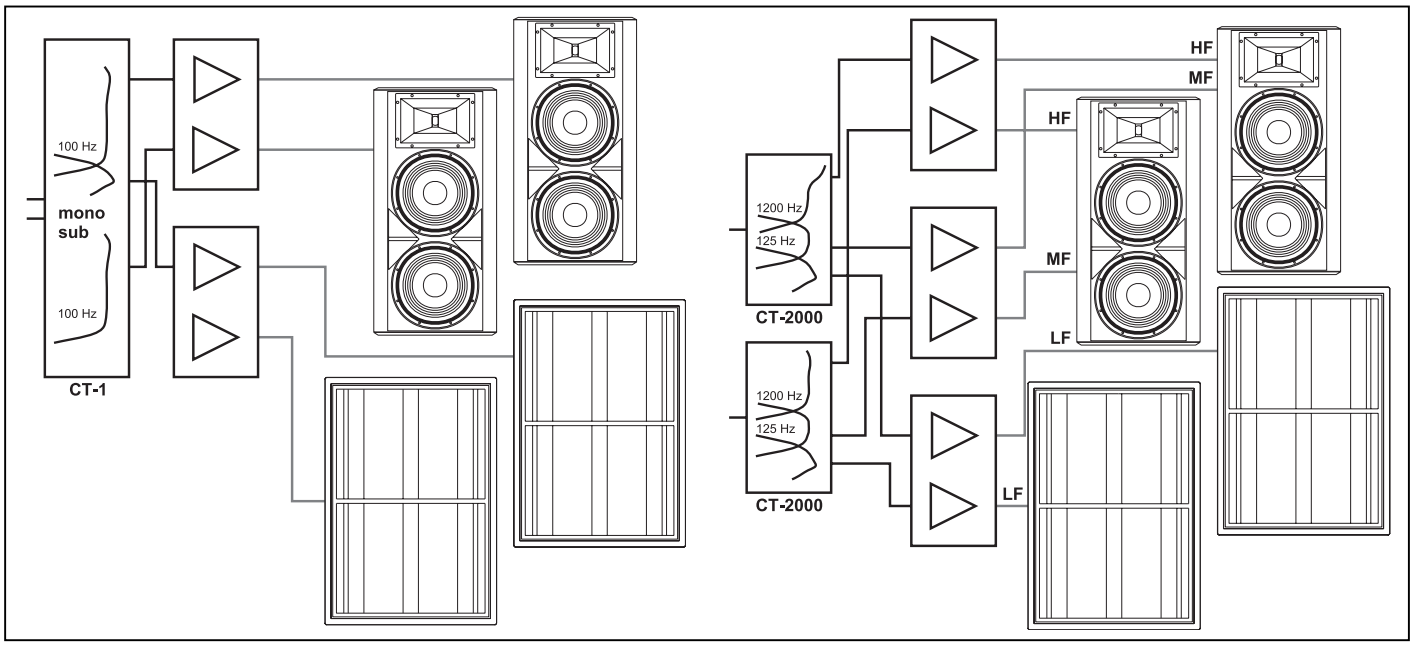
5.2 Stereo with subwoofers

R-112/R-115/R-214 con SUB-18R



(the CT-1's subwoofer output corresponds to the sum of the two input channels)

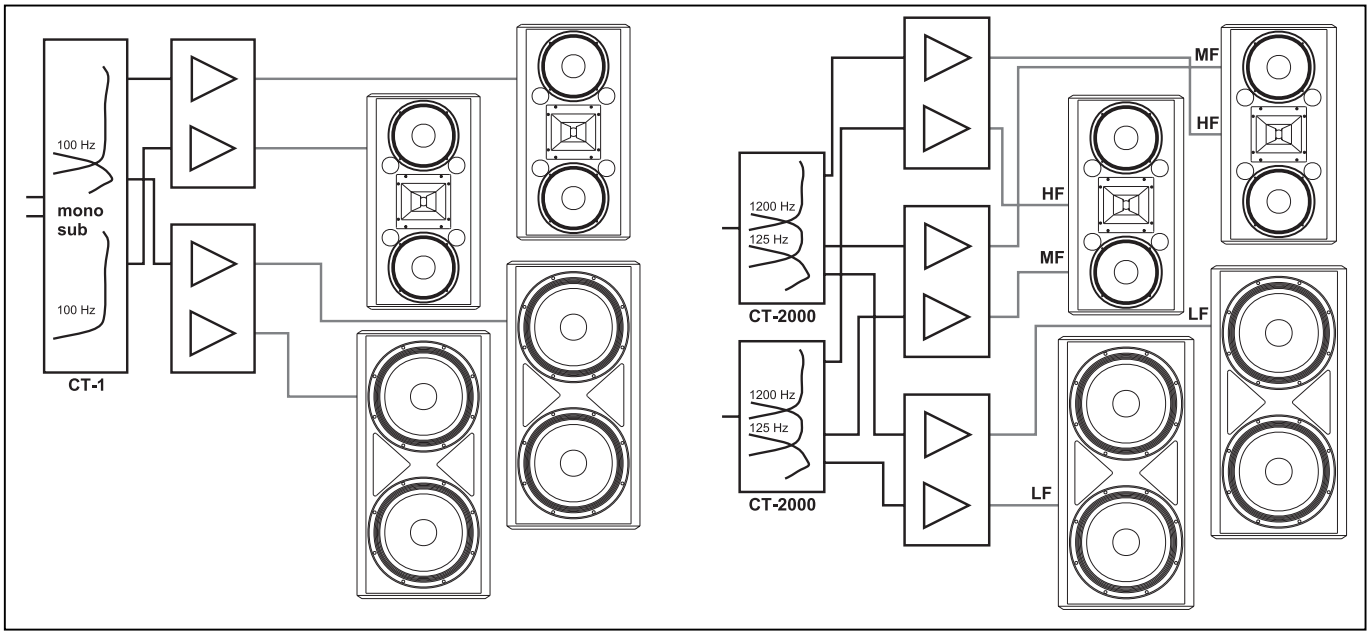
R-2000. Bi or tri-amplified. The R-2000 system is the combination of R-215 and ST-218. The same configurations are possible with R-212. Controller CT-2000 can also be exchanged for CT-1000 for the tri-amplified system.



(the CT-1's subwoofer output corresponds to the sum of the two input channels)

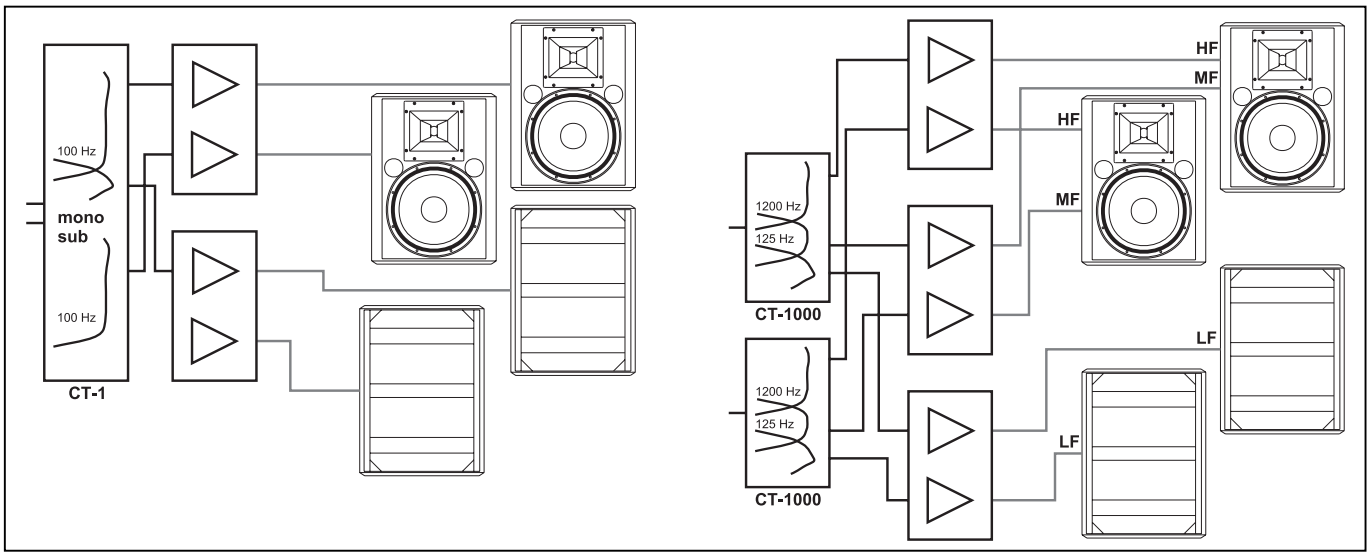
R-212/215 with SUB-218 (bi or tri-amplified three-way systems)

Use ST-218 bins when a turbulent bass sound with lots of punch is desired, and the SUB-18R when a cleaner deeper bass is preferred. ST-218 (R-2000) is recommended for outdoor use. Controller CT-2000 can also be exchanged for CT-1000 for the tri-amplified system.



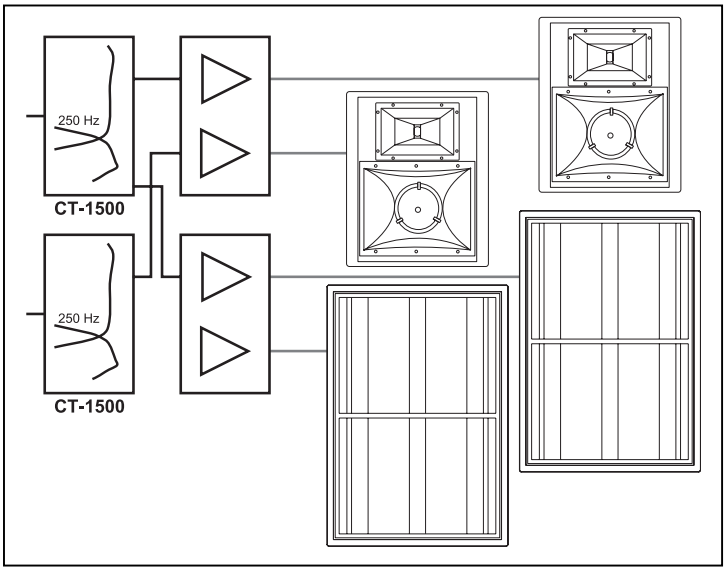
(the CT-1's subwoofer output corresponds to the sum of the two input channels)

ST-1000 in bi or tri-amplified modes. The ST-1000 system is the combination of ST-15 and ST-18. For bigger systems, the ST-18 can be replaced with smaller numbers of ST-218. ST-18/218 can be replaced with SUB-18R/218.

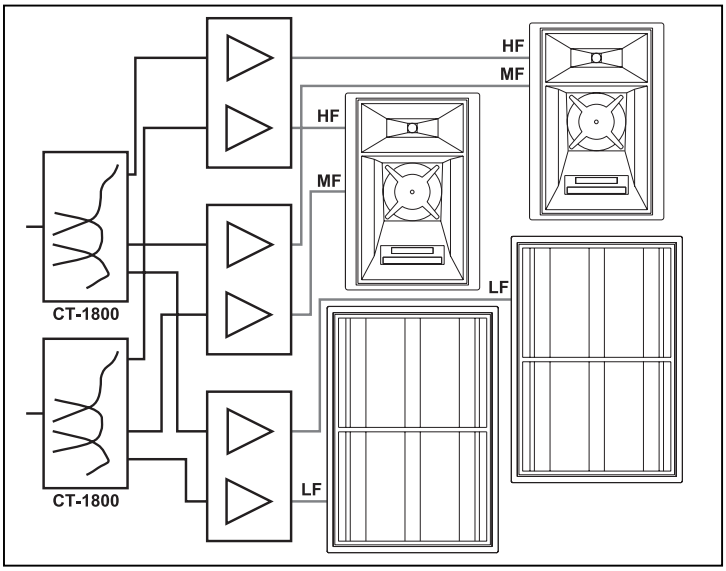


(the CT-1's subwoofer output corresponds to the sum of the two input channels)

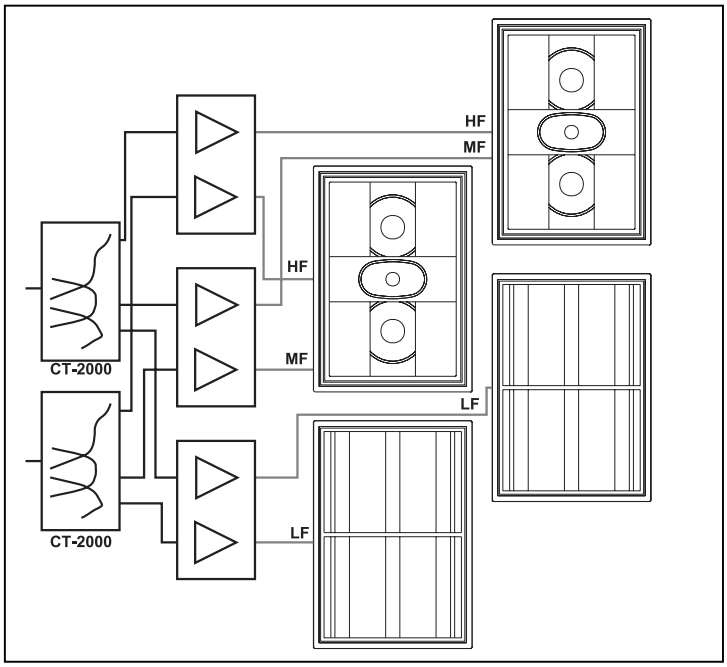
ST-1500. The ST-1500 system is the combination of ST-110 and ST-218.



ST-1800. The ST-1800 system is the combination of ST-112 and ST-218.



ST-2000. The ST-2000 system is the combination of ST-215 and ST-218.

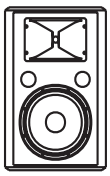


6. APPLICATION EXAMPLES

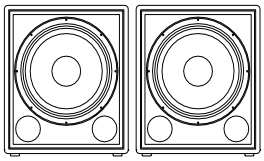
These examples are only design ideas for typical systems and diverse applications. They are in no case the only possible configurations. You can also scale them up or down for larger or smaller uses.

You can combine products from other D.A.S. series to cover needs such as background music and secondary fill systems.

6.1 Pub system



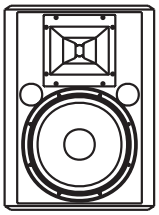
R-112. Distributed.
Distribuidas.



SUB-18R. Arrayed on the ground.
Agrupadas sobre el suelo.

6.2 Medium-sized theatre system

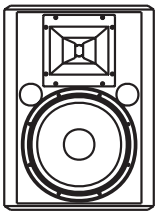
ST-15



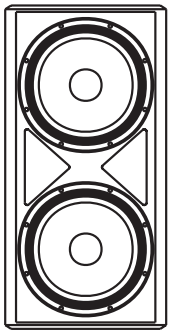
L

ST-15 flown.
ST-15 colgadas.

ST-15



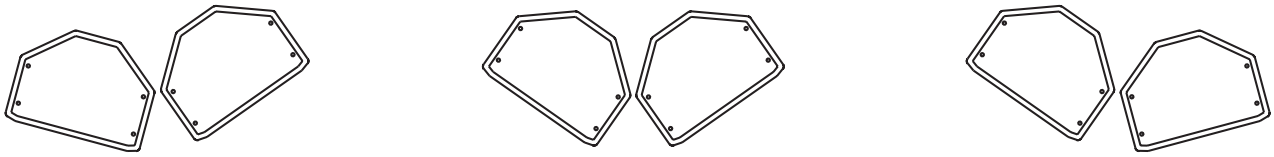
R



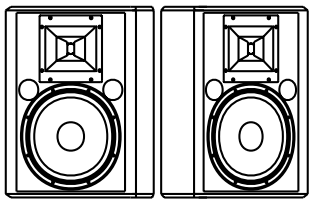
SUB-218
Mono subwoofer.
Sub-bajo en mono.

Mono L&R

6.3 Large theatre system

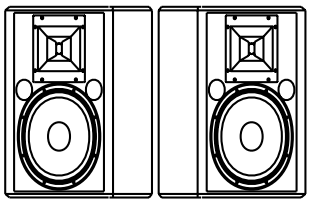


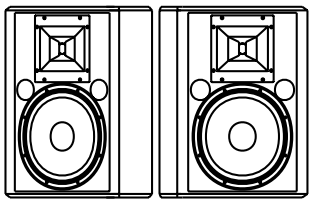
ST-15



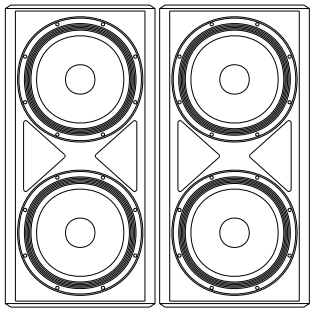
Flown.
Colgadas.

ST-15





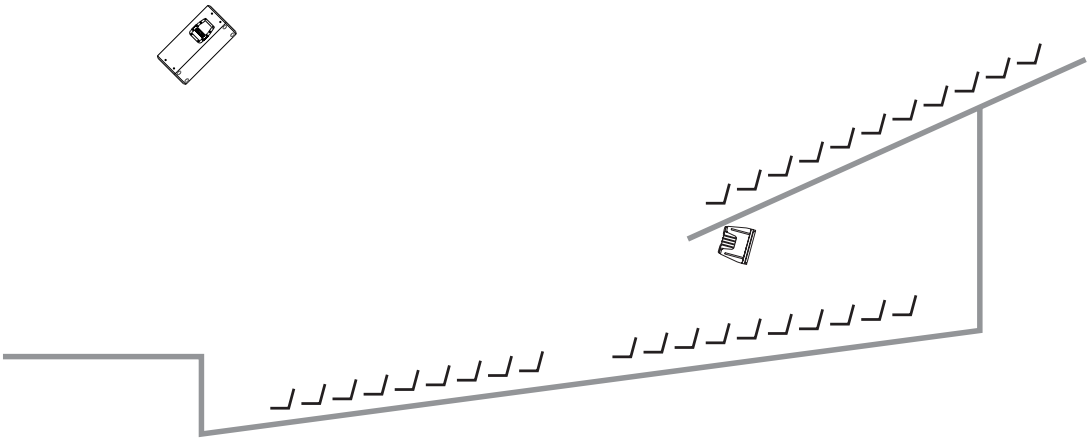
Left **Centre** **Right**



SUB-218
Mono subwoofers.
Sub-bajos en mono.

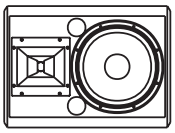
Mono L&R

DS-8 (2-way 8" system from DAS's Dynamics series) *(sistema de dos vías y 8" de la serie Dynamics de DAS)*
Underbalcony.
Bajo el anfiteatro.



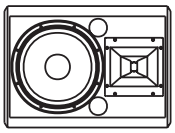
6.4 Medium-sized disco system

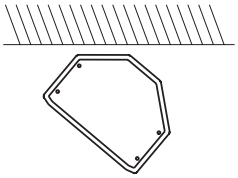
ST-15



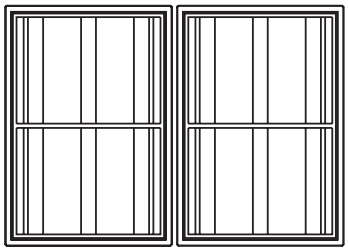
ST-15 suspended around the dance floor. Horizontal position. Horn rotated.
ST-15 colgadas alrededor de la pista de baile en posición horizontal con la trompeta girada.

ST-15

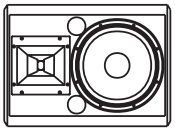




Low profile (low ceiling) use.
Utilización de bajo perfil para techos bajos.

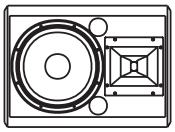


ST-218
Subwoofer mono ground array.
Grupo de sub-bajos sobre el suelo.

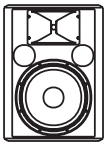


ST-15

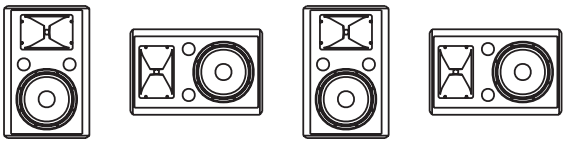
ST-15 suspended around the dance floor. Horizontal position. Horn rotated.
ST-15 colgadas alrededor de la pista de baile en posición horizontal con la trompeta girada.



ST-15



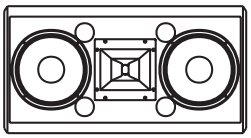
R-115. DJ monitor



R-112
Bar or secondary area fill.
Refuerzo para la barra o zonas secundarias.

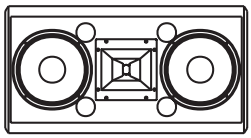
6.5 Large disco system

R-212

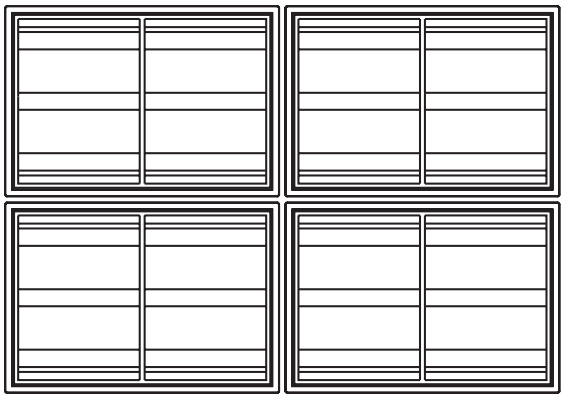


R-212 suspended around the dance floor. Horizontal position.
R-212 colgadas alrededor de la pista de baile en posición horizontal.

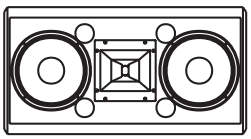
R-212



Low profile (low ceiling) use.
Utilización de bajo perfil para techos bajos.

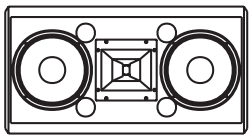


ST-218
Subwoofer mono ground stack.
Grupo de sub-bajos sobre el suelo.

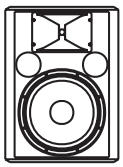


R-212

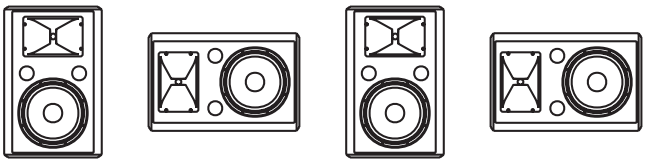
R-212 suspended around the dance floor. Horizontal position.
R-212 colgadas alrededor de la pista de baile en posición horizontal.



R-212



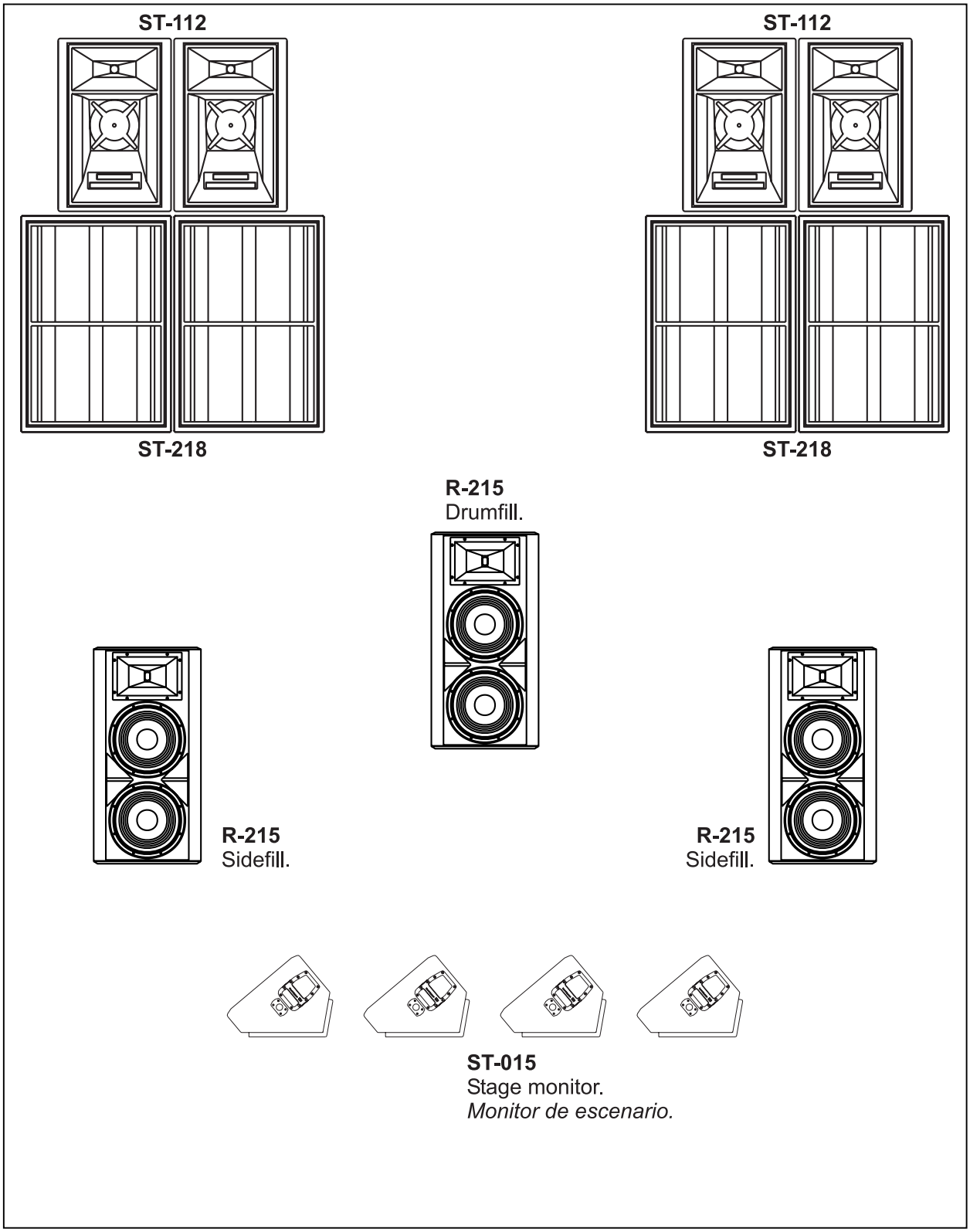
R-115. DJ monitor



R-112
Bar or secondary area fill.
Refuerzo para la barra o zonas secundarias.

F-5T (5" music monitor with transformer from DAS's Factor series) *(monitor musical de 5" con transformador de la serie Factor de DAS)*
Entrance and access areas.
Zonas de entrada y acceso.

6.6 Live sound system



7. USE

SWITCH ON/OFF

Switch your sound system on from back to front. Thus, switch on the amplifiers last. Switch sound sources (CDs, turntables) first, then your mixer, then your processors and crossovers and finally the amplifiers. If you have more than one amplifier, switch them on sequentially, one at a time.

Follow the reverse order when powering down, and switch off the amplifiers before any other element on your sound system.

AMPLIFIER POWER

In general, it is recommended that you use an amplifier with an output that is 100% to 150% of the speaker's average (RMS) power rating. That way we have headroom for the dynamics of real music and vocal signals, and at the same time deliver a cleaner signal to the speakers that will result in a more reliable system. Avoid using too small an amplifier.

AMPLIFIER CLIP

The clip light of your amplifiers should never be on continuously. This will distort the signal and may damage the speakers. In fact, severe clipping is an easy way to burn a speaker's voice coil. At most, the clip light could blink occasionally. When clipped, signals sound distorted and produce listening fatigue quickly. If you cannot get the desired level without overloading the amplifier, use a larger amplifier or consider expanding your system.

AMPLIFIER LEVEL CONTROLS

Although related to output power, an amplifier channel's level control it is not a direct representation of it. Thus, we can have maximum output power with the level at mid position. Similarly, we may have the level controls at maximum and not have maximum output if our source signal is not hot enough.

One way to use an amplifier's volume controls, particularly for fixed installations, is to set them such that when the mixer's faders are at their maximum level, we are just below clipping level on the amplifier or clipping very occasionally.

EQUALISATION

D.A.S. enclosures do not need extreme EQ settings to produce quality sound. Avoid high levels of gain on the equalisers. We do not recommend the use of EQ gain values above +6 dB.

On graphic type equalisers, avoid gain to bands that are below the systems working frequency range (for instance, do not bring up the 30 Hz band when using an RF-115).

HIGH-PASS (SUBSONIC) FILTER

It is good recommended practice to use a high-pass filter for the lowest frequency component in your system (i.e. the full-range enclosure; or the subwoofer if using subwoofer reinforcement). This way we avoid problems derived from excess excursion ("bottoming out") when trying the reproduce frequencies that go beyond a system's band-pass, and we are able to put that power to use, instead of it going to waste. Thus, appropriate high-pass filtering maximises acoustic power and makes systems more reliable.

We recommend enabling a high-pass filter frequency that is equal or higher than the system's lower usable frequency, as found in the "Specifications" sections of this manual.

For instance, for an R-215 used as a full-range box, set the high pass frequency to 40 Hz or higher, 35 Hz or higher if reinforced with SUB-218.

D.A.S. processors provide high-pass filtering.

HEARING DAMAGE

ST and R series systems can produce high sound pressure levels. Exposure to these may cause permanent hearing damage. The amount of loss varies from person to person, but any person can get hearing loss if exposed to enough noise level for a long enough periods of time. Check the local safety at work regulations in your country or state for specific exposure levels and durations. To prevent exposure to dangerous levels, the use of hearing protectors is encouraged. If you are frequently exposed to high sound pressure levels, it is recommended that you visit your doctor and have you hearing tested periodically.

R Series

	R-112	R-115	R-214	R-212	R-215	SUB 18R	SUB 218
RMS (Average) Power Handling:	300 W	350 W	700 W	800 W LF/FULL 200 W HI	1200 W LF/FULL 200 W HI	700 W	1200 W
[P] **Programme Power Handling:**	600 W	700 W	1400 W	1600 W LF/FULL 400 W HI	2400 W LF/FULL 400 W HI	1400 W	2400 W
[K] **Peak Power Handling:**	1200 W	1400 W	2800 W	3200 W LF/FULL 800 W HI	4800 W LF/FULL 800 W HI	2800 W	4800 W
[F] **On-axis Frequency Range:**	40 Hz - 15 kHz	50 Hz - 16 kHz	45 Hz - 15 kHz	45 Hz - 20 kHz	40 Hz - 20 kHz	32 Hz - 300 Hz (usable)	35 Hz - 1 kHz (usable)
Nominal Impedance:	8 ohm	8 ohm	4 ohm	4 ohm LF/FULL 8 ohm HI	4 ohm LF/FULL 8 ohm HI	8 ohm	4 ohm
[I] **Minimum Impedance:**	6.8 ohm (9.6 kHz)	6.5 ohm (15 kHz)	3.3 ohm (54 Hz)	LF: 3.8 ohm HF: 7.6 ohm	LF: 4.1 ohm HF: 7.5 ohm	6.2 ohm (37 Hz)	3.8 ohm (44 Hz)
[S] **On-axis Sensitivity: (1W / 1 m)**	98 dB	99 dB	102 dB	LF: 102 dB HF: 99 dB	LF: 102 dB HF: 101 dB	99 dB	101 dB
Rated Peak SPL at Full Power:	129 dB	130 dB	136 dB	137 dB LF/FULL 128 dB HI	138 dB LF/FULL 130 dB HI	133 dB	137 dB
[B] **Nominal -6 dB Beamwidths (coverage angles):**	95° Horizontal 80° Vertical (500 Hz - 8 kHz)	90° Horizontal 75° Vertical (500 Hz - 8 kHz)	80° Horizontal 45° Vertical (500 Hz - 8 kHz)	90°x40° FULL 100°x60° BIAMP (500 Hz - 8 kHz)	80°x55° FULL 85°x50° BIAMP (500 Hz - 8 kHz)	360° Horizontal 360° Vertical (100 Hz)	360° Horizontal 360° Vertical (100 Hz)
[C] **Speech Coverage Angles:**	100° Horizontal 80° Vertical	90° Horizontal 80° Vertical	90° Horizontal 45° Vertical	90°x50° FULL 105°x65° BIAMP	85°x60° FULL 95°x60° BIAMP	----	----
Transducers/ Replacement Parts:	LF: 12P/ GM 12P HF: M-3/ GM M-5	LF: 15P/ GM 15P HF: M-5/ GM M-5	LF: 2 x 15P/ GM 15P HF: M-5/ GM M-5	LF: 2 x 12B/ GM 12B HF: ND-10/ GM K-8	LF: 2 x 15G/ GM 15G HF: ND-10/ GM K-8	18G/ GM 18G	2 x 18G/ GM 18G
Handles:	Bar handles			Hand locations	Bar handles		Hand locations
Enclosure Material:	Composite Wisa® birch plywood						
Finish:	Black catalysed polyurethane paint						
Enclosure shape:	Trapezoidal					Rectangular	
Connector:	Speakon NL4 (+1, -1)	Speakon NL4 (+1, -1)	Speakon NL4 (+1, -1)	Speakon NL4 LF/FULL: (+1, -1) HF: (+2, -2)	Speakon NL4 LF/FULL: (+1, -1) HF: (+2, -2)	Speakon NL4 (+1, -1)	Speakon NL4 (+1, -1)
[1] **Dimensions (H x W x D):**	69 x 44 x 36 cm (27.5x17.5x14.5 in)	71 x 51 x 38 cm (28x20x15 in)	105 x 48 x 39 cm (42x19.5x15.5 in)	99 x 51 x 41 cm (39x20x16.5 in)	112 x 55 x 50 cm (44.5x22x20 in)	64 x 55 x 53 cm (25.5x22x21 in)	112 x 55 x 48 cm (44.5x22x19 in)
Rigging:	eyebolts					----	eyebolts
Weight:	24.8 kg (54.6 lbs.)	29.2 kg (64.3 lbs.)	38 kg (83.6 lbs.)	52 kg (114.5 lbs.)	60 kg (132 lbs.)	40.3 kg (89 lbs.)	59 kg (130 lbs.)
Shipping Weight:	28 kg (61.6 lbs.)	33 kg (72.6 lbs.)	41.2 kg (90.6 lbs.)	55 kg (122 lbs.)	66 kg (144 lbs.)	43.3 kg (95 lbs.)	64 kg (140.5 lbs.)

[1] Height includes 1cm corresponding to the rubber feet on the bottom of the enclosures.
[P] Conventionally 3 dB higher than the RMS measure, although this already utilises a programme signal.
[K] Corresponds to the standard 6 dB crest factor.
[F] As per IEC 268-5 (1989, -10 dB). Half space anechoic.
[I] In practice cable and connector impedance has to be added to all impedance values.
[S] IEC average.
[B] Average of one-third octave band measures. Computed from polar information measured at two degree angular and 1/24th octave frequency resolution. AUTOPOL, a platform consisting of custom and customised hardware and software, was used for the automated high-resolution acquisition and post-processing of directivity data. The digital storage of the data allows further processing and conversion to other software formats.
[c] There is currently no standard method of averaging the beamwidth with frequency characteristics into a single meaningful figure, which impedes comparisons across manufacturers and very often even product lines. This, our own, criterion weighs the -6 dB coverage angles from one-octave bands according to their contribution to speech intelligibility.
Product improvement through research and technology is a continuous process at D.A.S. Audio. All specifications subject to change without notice. Architectural Specifications, detailed specification sheets, as well as data for EASE and other electro-acoustic prediction tools are available from http://www.dasaudio.com/.

ST Series

	ST-015	ST-15	ST-18	ST-32	ST-110	ST-112	ST-215	ST-218
RMS (Average) Power Handling:	500 W	400 W LF/FULL 200W HF	600 W	300 W	400 W	400 W MF 200W HF	800 W MF 200W HF	1200 W
[P] **Programme Power Handling:**	1000 W	800 W LF/FULL 400W HF	1200 W	600 W	800 W	800 W MF 400W HF	1600 W MF 400W HF	2400 W
[K] **Peak Power Handling:**	2000 W	1600 W LF/FULL 400W HF	2400 W	1200 W	1600 W	1600 W MF 800W HF	3200 W MF 800W HF	4800 W
[F] **On-axis Frequency Range:**	56 Hz - 17 kHz	40 Hz - 20 kHz	40 Hz - 300 Hz (usable)	60 Hz – 18 kHz	175 Hz - 19 kHz	90 Hz - 19 kHz	70 Hz - 18 kHz	35 Hz - 300 Hz (usable)
Nominal Impedance:	8 ohm	8 ohm	8 ohm	8 ohm	8 ohm	MF: 8 ohm HF: 8 ohm	MF: 8 ohm HF: 8 ohm	4 ohm
[I] **Minimum Impedance:**	6.8 ohm (295 Hz)	LF: 6.3 ohm HF: 7.6 ohm	7.6 ohm (73 Hz)	6.0 ohm (195 Hz)	7.0 ohm (8 kHz)	MF: 7.3 ohm HF: 10.5 ohm	MF: 3.2 ohm HF: 10.4 ohm	3.8 ohm (73 Hz)
[S] **On-axis Sensitivity: (1W / 1 m)**	101 dB	LF: 100 dB HF: 99 dB	99 dB	98 dB	105 dB	MF: 107 dB HF: 107 dB	MF: 108 dB HF: 108 dB	102 dB
Rated Peak SPL at Full Power:	134 dB	LF: 132 dB HF: 128 dB	133 dB	123 dB	137 dB	MF: 139 dB HF: 136 dB	MF: 143 dB HF: 137 dB	139 dB
[B] **Nominal -6 dB Beamwidths (coverage angles):**	90°x65° (500 - 8k Hz)	85°x70° FULL 85°x80° BIAMP (500 - 8k Hz)	360° Horizontal 360° Vertical (100 Hz)	80° Horizontal 80° Vertical (500 - 8k Hz)	80° Horizontal 70° Vertical (500 - 8k Hz)	55° Horizontal 50° Vertical (500 - 8k Hz)	45° Horizontal 40° Vertical (nominal)	360° Horizontal 360° Vertical (100 Hz)
[C] **Speech Coverage Angles:**	90°x70°	90°x75° FULL 90°x85° BIAMP	----	80° Horizontal 80° Vertical	85° Horizontal 85° Vertical	60° Horizontal 60° Vertical	65° Horizontal 60° Vertical	----
Transducers/ Replacement Parts:	LF: 15BN/ GM 15B HF: M-10N/ GM M-10	LF: 15B/ GM 15B HF: ND-10/ GM K-8	18G/ GM 18G	LF: 15BCX/ GM 15B HF: 15BCX/ GM M-5	LF: 10B/ GM 10B HF: ND-10/ GM K-8	LF: 12B/ GM 12B HF: ND-10/ GM K-8	LF: 2 x 15B/ GM 15B HF: ND-8/ GM K-8	2 x 18G/ GM 18G
HF protection capacitance:	----					44 µf		----
Handles:	Bar handles						Hand locations	
Enclosure Material:	Composite Wisa® birch plywood							
Finish:	Black catalysed polyurethane paint							
Enclosure shape:	Wedge, multi-angle	Multi-angle	Rectangular	Wedge, multi-angle	Trapezoidal	Trapezoidal	Trapezoidal	Rectangular
Connector:	Speakon NL4 (+1, -1)	Speakon NL4 LF/FL.:(+1, -1) HF: (+2, -2)	Speakon NL8 (+1, -1)	Speakon NL4 (+1, -1)	Speakon NL4 (+2, -2)	Speakon NL8 MF: (+2, -2) HF: (+3, -3)	Speakon NL8 MF: (+2, -2) HF: (+3, -3)	Speakon NL8 (+1, -1)
[1] **Dimensions (H x W x D):**	47 x 64 x 60 cm (18.5x25x23.5 in)	71 x 51 x 38 cm (28x20x15 in)	71 x 51 x 73 cm (28x20x29 in)	46 x 54 x 62 cm (18x21x24.5 in)	71 x 55 x 45 cm (28x22x17.5 in)	84 x 55 x 59 cm (33x22x23.5 in)	103 x 70 x 84 cm (40.5x27.5x33 in)	101 x 70 x 85 cm (40x27.5x33.5 in)
Rigging:	----	eyebolts		----	Ancra Track / eyebolts			eyebolts
Weight:	28 kg (62 lbs.)	33 kg (73 lbs.)	50 kg (110 lbs.)	28.6 kg (63 lbs.)	49 kg (107.8 lbs.)	62 kg (136.4 lbs.)	75 kg (165.5 lbs.)	82 kg (181 lbs.)
Shipping Weight:	31.5 kg (82 lbs.)	37.5 kg (82 lbs.)	54 kg (118 lbs.)	31.8 kg (70 lbs.)	52 kg (114.4 lbs.)	70 kg (154lbs.)	83 kg (183 lbs.)	90 kg (199 lbs.)

[1] Height includes 1cm corresponding to the rubber feet on the bottom of the enclosures. Depth includes wheels if applicable.
[P] Conventionally 3 dB higher than the RMS measure, although this already utilises a programme signal.
[K] Corresponds to the standard 6 dB crest factor.
[F] As per IEC 268-5 (1989, -10 dB). Half space anechoic.
[I] In practice cable and connector impedance has to be added to all impedance values. For the HF sections of models ST-112 and ST-215, an impedance value that complied with IEC 268-5 would be 12 ohms.
[S] IEC average.
[B] Average of one-third octave band measures. Computed from polar information measured at two degree angular and 1/24th octave frequency resolution. AUTOPOL, a platform consisting of custom and customised hardware and software, was used for the automated high-resolution acquisition and post-processing of directivity data. The digital storage of the data allows further processing and conversion to other software formats.
[c] There is currently no standard method of averaging the beamwidth with frequency characteristics into a single meaningful figure, which impedes comparisons across manufacturers and very often even product lines. This, our own, criterion weighs the -6 dB coverage angles from one-octave bands according to their contribution to speech intelligibility.
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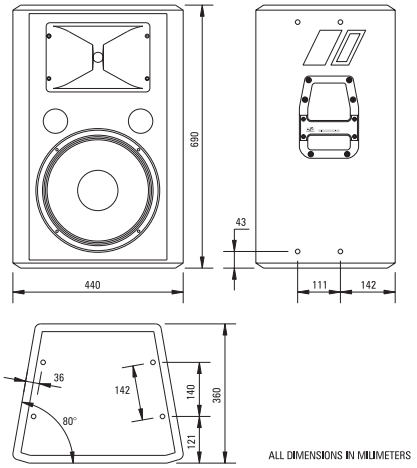
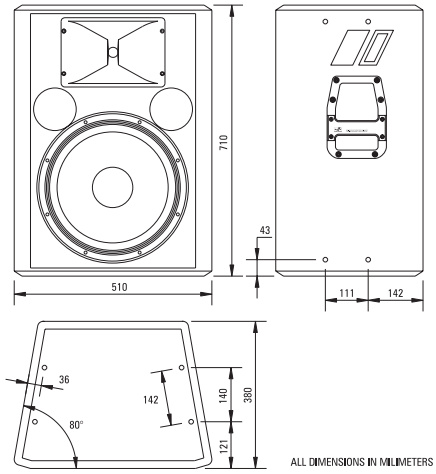
9. LINE DRAWINGS

R-112



ALL DIMENSIONS IN MILIMETERS

R-115



ALL DIMENSIONS IN MILIMETERS

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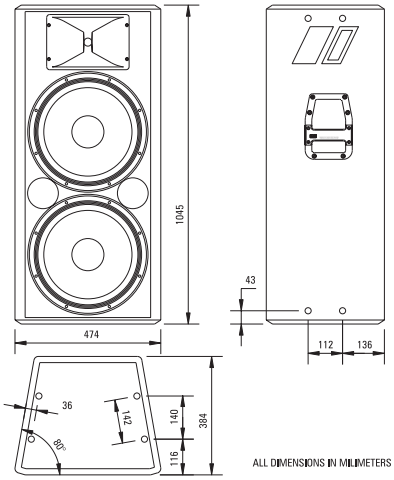
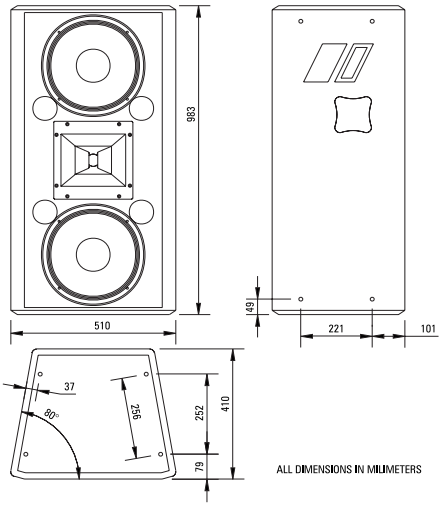


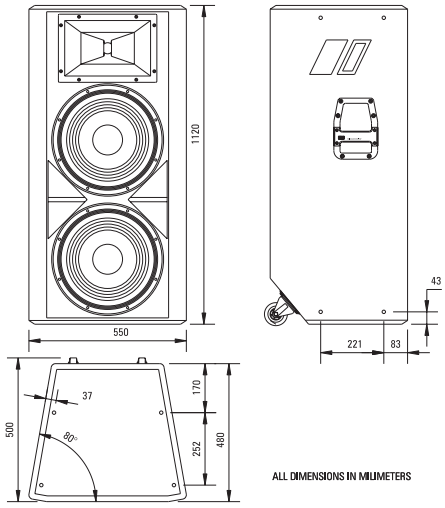
ALL DIMENSIONS IN MILIMETERS

R-212



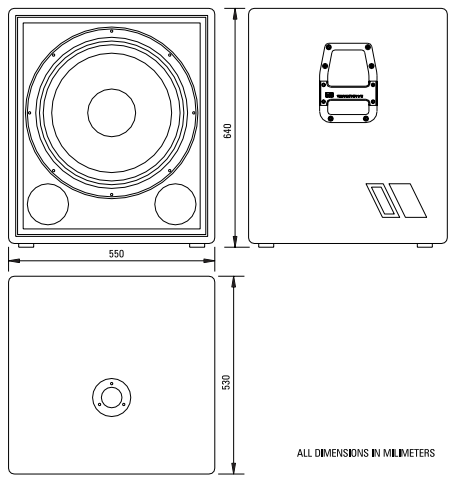
ALL DIMENSIONS IN MILIMETERS

R-215



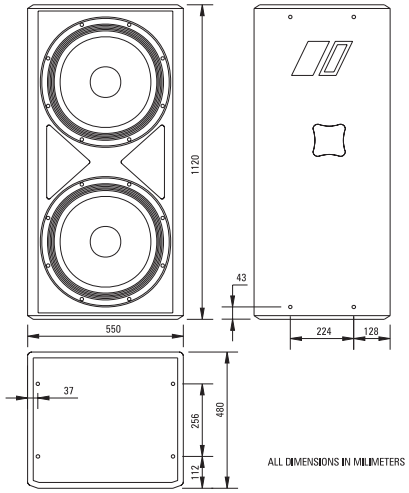
ALL DIMENSIONS IN MILIMETERS

SUB-18R



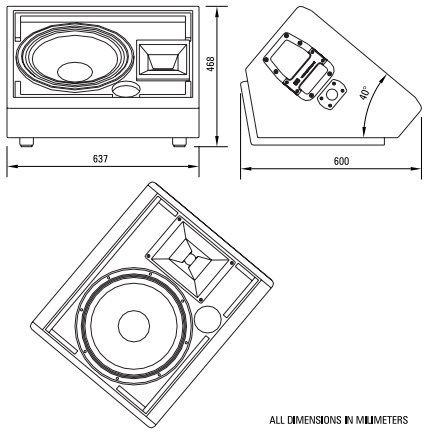
ALL DIMENSIONS IN MILIMETERS

SUB-218

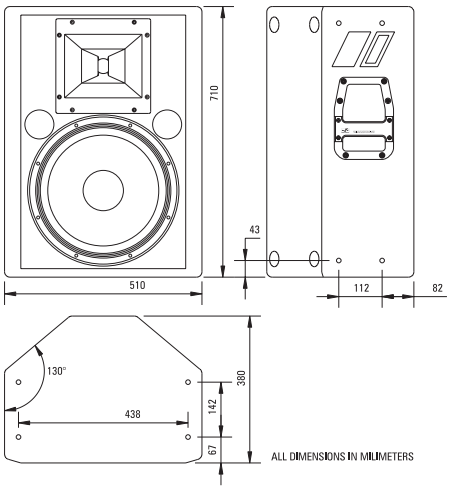


ALL DIMENSIONS IN MILIMETERS

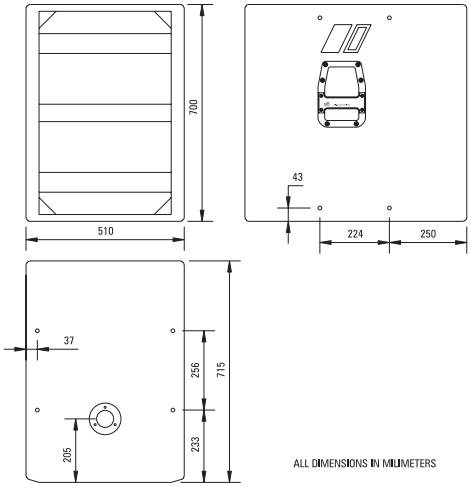
ST-015



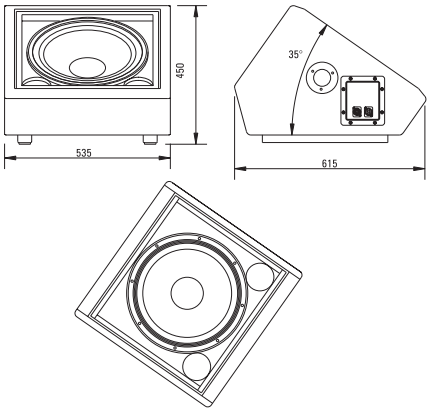
ST-15



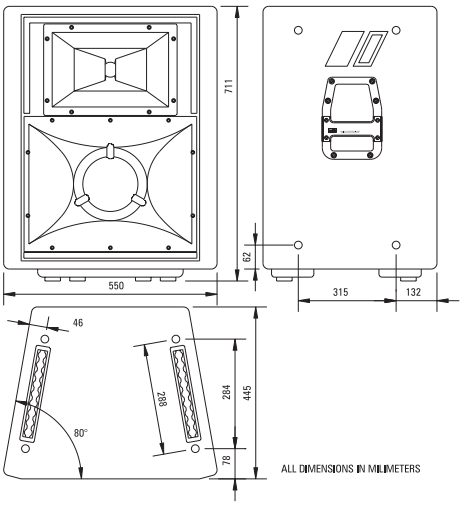
ST-18



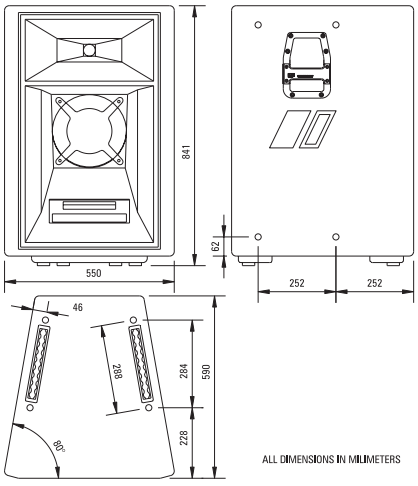
ST-32



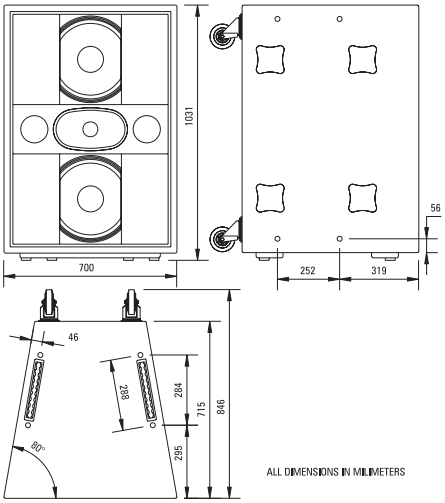
ST-110



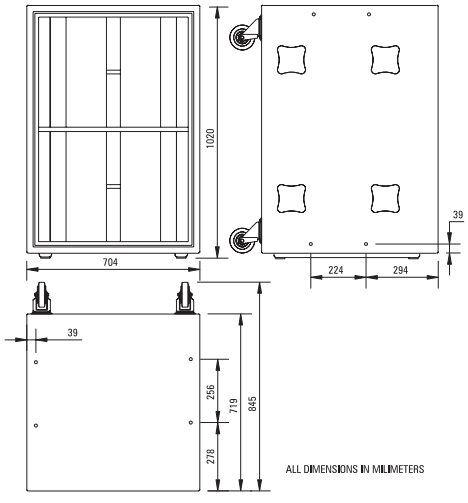
ST-112



ST-215



ST-218



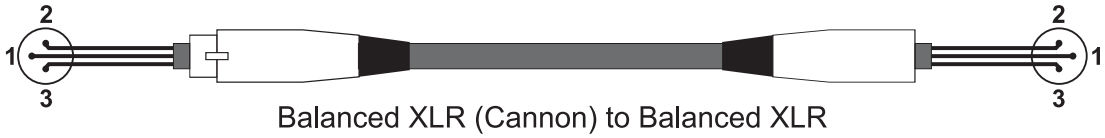
Appendix A. Line connections : un-balanced and balanced

There are two basic ways to transport an audio signal with microphone or line level:

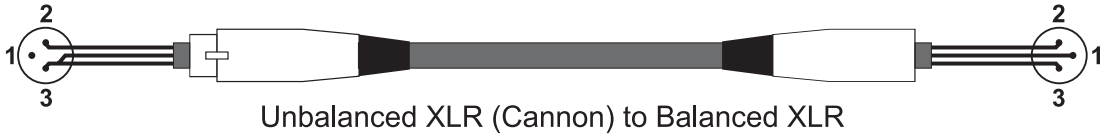
Un-balanced line: Utilising a two-conductor cable, it transports the signal as the voltage between them. Electro-magnetic interference can get added to the signal as undesired noise. Connectors that carry un-balanced signals have two pins, such as RCA (*Phono*) and ¼" (6.35 mm, often referred to as jack) mono. 3-pin connector such as XLR (*Cannon*) may also carry un-balanced signals if one of the pins is unused.

Balanced line: Utilising a three-conductor cable, one of them acts as a shield against electro-magnetic noise and is the ground conductor. The other two have the same voltage with respect to the ground conductor but with opposite signs. The noise that cannot be rejected by the shield affects both signal conductors in the same way. At the device's input the two signals get summed with opposite sign, so that noise is cancelled out while the programme signal doubles in level. Most professional audio devices use balanced inputs and outputs. Connectors that can carry balanced signal have three pins, such as XLR (*Cannon*) and ¼" (6.35 mm) stereo.

The graphs that follow show the recommended connection with different types of connectors to balanced processor or amplifier inputs. The connectors on the left-hand side come from a signal source, and the ones on the right hand side go to the inputs of the processor or amplifier. Note that on the un-balanced connectors on the left-hand side, two terminals are joined inside the connector. If hum occurs with balanced to balanced connections, try disconnecting the sleeve (ground) on the input connector.



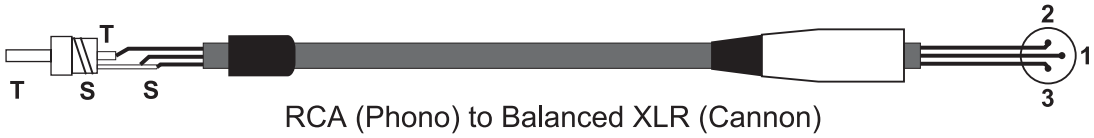
Balanced XLR (Cannon) to Balanced XLR



Unbalanced XLR (Cannon) to Balanced XLR

Balanced 1/4" (*Jack*) to Balanced XLR (Cannon)

Unbalanced 1/4" Jack to Balanced XLR (Cannon)



RCA (Phono) to Balanced XLR (Cannon)

Balanced 1/4" (*Jack*) to Balanced 1/4" (*Jack*)

Unbalanced 1/4" (*Jack*) to Balanced 1/4" (*Jack*)

RCA (Phono) to Balanced 1/4" (*Jack*)

Appendix B.
Contact details for flying hardware manufacturers

ATM Fly-Ware
ATM provides a wide range of flying hardware and accessories.

ATM Fly-Ware
21000 South Wilmington Ave.
Carson, CA 90810-1247
UNITED STATES OF AMERICA
Tel: 888-RIG-MORE (toll-free, from USA only)
Tel: (+1) 310-834-5914
Fax: (+1) 310-834-3042
E-mail: clientservice@atmflyware.com
Web: http://www.atmflyware.com

In Europe:
Autograph Sales
102 Grafton Road
London NW5 4BA, UK
Tel:(+44) 0171.482.3300
Fax: (+44) 0171.482.4484.
E-mail:sales@autograph.co.uk
Web: http://www.autograph.co.uk

ATM has selected from their catalogue the appropriate truss modules for the following enclosures:

Model	Truss module / connecting bar
ST-110	MEGS-356-T / MEGS-356-TB
ST-112	MEGS-356-T / MEGS-356-TB
ST-215	MEGS-575-T / MEGS-575-TB
ST-218	MEGS-575-T / MEGS-575-TB

A connecting bar interconnects every two trusses. Thus, for each array, we will need one bar less than trusses. For example, a three-wide array will need three truss modules and two connecting bars.
Depending on the array requirements, pull strap bars (AMFS-3X4-30"BAR) may be needed to achieve proper down angles.

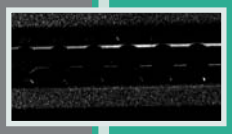
Polar Focus
Manufacturers of universal systems and truss modules for flying speaker enclosures.
Web: http://www.polarfocus.com

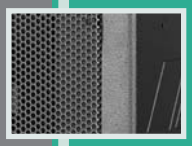
Worldwide distribution by :
Allen Products Company
1635 E. Burnett Street
Signal Hill, CA 90806
UNITED STATES OF AMERICA
Tel: 800-4APC-INC (toll-free, from USA only)
Tel: (+1) 562-424-1100
Fax: 888-FAX-2-APC (toll-free, from USA only)
Fax: (+1) 562-424-3520
Web: http://www.allenproducts.com

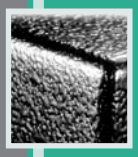
Sound Manufacturing Inc.
Manufacturers of accessories for speaker flying.

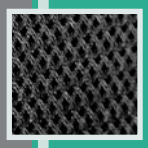
869 Knickerbocker Rd
P.O. Box 1907
Big Bear Lake, CA 92315-1907
UNITED STATES OF AMERICA
Tel: (909) 878-9104
Fax: (909) 878-4248
E-mail: srmsmi@aol.com
Web: www.smirigging.com

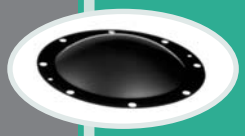
NOTAS/*NOTES*

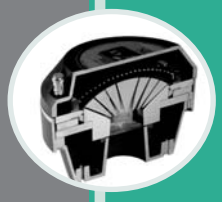












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46988 Fuente del Jarro - Valencia, SPAIN
Tel. 96 134 0525 - Tel. Intl. +34 96 134 0860
Fax. 96 134 0607 - Fax. Intl. +34 96 134 0607

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Sunset Palmetto Park 6816 NW 77th Court. Miami, FL.
33166 - U.S.A. Tel. 305 436 0521 - Fax. 305 436 0528

http://www.dasaudio.com

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